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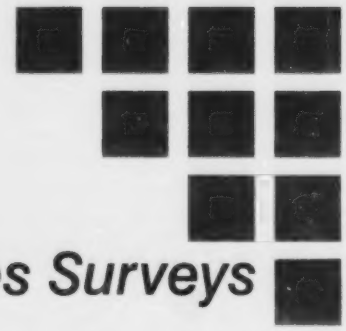


The National Graduates Surveys

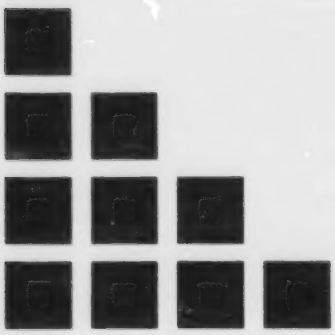
Education-Job Skills Match
An Analysis of the 1990 and 1995 National Graduates Surveys

R-00-1-1E

by
Harvey Krahn and Jeffrey W. Bowlby

October 1999

Research Paper



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This report is part of a set of research studies on the National Graduates Surveys.
Le présent rapport fait partie d'un ensemble d'études sur les Enquêtes nationales auprès de diplômés.

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Printed/Imprimé 2000
ISBN: 0-662-29283-9
Cat. No./N° de cat. MP32-29/00-1-1E

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General enquiries regarding the documents published by the Applied Research Branch should be addressed to:

Publications Office
Applied Research Branch
Strategic Policy
Human Resources Development Canada
165 Hôtel-de-Ville Street, Phase II, 7th Floor
Hull, Quebec, Canada
K1A 0J2

Telephone: (819) 994-3304
Facsimile: (819) 953-9077
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165, rue Hôtel-de-Ville, Phase II, 7e étage
Hull (Québec) Canada
K1A 0J2

Téléphone : (819) 994-3304
Télécopieur : (819) 953-9077
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Abstract

The fit between post-secondary education and training and subsequent employment outcomes has become a public policy concern in recent years. At the same time, there has been a shift in how the education-job match is conceptualized. While many observers continue to evaluate post-secondary institutions primarily on their ability to train graduates for specific occupations, the argument that there is value in developing more transferable, generic skills in today's information-based economy has gained acceptance.

This research monograph uses 1990 and 1995 National Graduates Survey data to examine the degree of fit between post-secondary education and subsequent employment, using two different approaches. The program-job match approach focuses on the fit between the type of post-secondary program completed and the type of job obtained. The generic skills approach examines the degree of fit between jobs and generic employability skills developed in post-secondary programs.

Findings reveal that no matter which measurement strategy is used, graduates from professional programs, particularly those in the health science field, as well as masters and doctoral degree graduates, experience a better education-job match. Beyond this, findings on education-job skills match are dependent on the methodology used. For example, a program-job match approach focussing on credentials reveals large field-of-study differences, although such differences are reduced or disappear when a generic skills approach is applied. A better education-job match is found, for example, for humanities and social science university undergraduates when generic skills acquired in programs are accounted for, than when assessments of job fit are based solely on credentials.

Analysis reveals that leadership and teamwork skills are less likely to be developed in the post-secondary system, compared to cognitive, communication and new-technology skills. Whether or not educators conclude that the post-secondary education system should be charged with developing such skills, it would still be useful to ask whether they could be enhanced while pursuing other more primary educational and training goals.

Findings also reveal that a significant minority of post-secondary graduates do not have the opportunity to use all of their employment-related skills in their jobs. In order to take full advantage of the human capital being created in Canada's post-secondary education system, employers should be encouraged to seek ways to enhance the skill requirements of jobs in their workplaces. They should also be invited to look outside the traditional programs that have provided their new employees. This report clearly demonstrates that some generic employability skills seen as essential in today's knowledge economy are being developed in programs with less occupational-specific training mandates.

Résumé

L'adéquation entre l'instruction et la formation postsecondaires et les résultats subséquents sur le marché du travail est devenue une préoccupation en matière de politique gouvernementale ces dernières années. Parallèlement, la conceptualisation de la concordance études-emploi a pris un tournant. Tandis que nombre d'observateurs continuent d'évaluer les établissements d'enseignement postsecondaire principalement en fonction de leur capacité de former des diplômés en vue de professions précises, on accepte maintenant l'argument selon lequel il est utile d'acquérir des compétences plus transférables et plus générales dans l'économie axée sur l'information d'aujourd'hui.

Le présent compte-rendu de recherche utilise les données de l'Enquête nationale auprès des diplômés de 1990 et 1995 pour étudier le degré d'adéquation entre l'instruction postsecondaire et l'emploi subséquent en adoptant deux approches différentes. L'approche concernant la concordance programme-emploi se concentre sur l'adéquation entre le genre de programme d'études postsecondaires suivi et le genre d'emploi obtenu. L'approche concernant les compétences générales examine l'adéquation entre les emplois et les compétences générales relatives à l'employabilité acquises dans le cadre de programmes d'études postsecondaires.

Il ressort des constatations que, quelle que soit la stratégie de mesure utilisée, la concordance études-emploi est mieux assortie pour les diplômés des programmes professionnels, en particulier, dans le domaine des sciences, et les détenteurs de maîtrise et de doctorat. Mise à part ces résultats, les constatations sur la concordance études-compétences professionnelles dépendent de la méthode utilisée. Par exemple, une approche concernant la concordance programme-emploi qui porte principalement sur les diplômes révèle des différences importantes entre les domaines d'études, bien que celles-ci soient réduites ou n'existent plus lorsqu'une approche concernant les compétences générales est utilisée. On constate une meilleure concordance études-emploi, par exemple, chez les détenteurs de diplômes universitaires de premier cycle en sciences humaines et sociales lorsque les compétences générales acquises dans le cadre de ces programmes sont prises en considération, que dans les cas où l'évaluation de l'adéquation avec l'emploi se fonde uniquement sur les diplômes.

L'analyse révèle que le système d'enseignement postsecondaire est moins susceptible d'enseigner des compétences en leadership et en travail d'équipe que des compétences cognitives, en communication et en nouvelle technologie. Que les éducateurs concluent ou non que le système d'éducation postsecondaire doit se charger de perfectionner de telles compétences, il serait toujours utile de se demander si elles peuvent être améliorées tout en poursuivant d'autres objectifs plus importants en matière d'éducation et de formation.

Les constatations révèlent également qu'une minorité importante de diplômés d'études postsecondaires n'ont pas la possibilité de mettre en pratique toutes leurs compétences relatives à l'emploi dans le cadre de leurs activités professionnelles. Pour tirer pleinement profit du capital humain créé dans le système d'éducation postsecondaire du Canada, il faudrait inciter les employeurs à trouver des moyens de relever les exigences professionnelles des emplois qu'ils offrent. Il faudrait également les inviter à chercher des candidats hors des programmes traditionnels qui ont fourni leurs nouveaux employés. Le présent rapport montre clairement que les programmes de formation moins axée sur des professions précises offrent quelques compétences générales relatives à l'employabilité considérées essentielles dans l'économie du savoir d'aujourd'hui.

101-05718/

Acknowledgements

This study was commissioned by Human Resources Development Canada and Statistics Canada. The interpretations of the data are those of the authors, and not necessarily those of the sponsoring agencies. Marc Frenette, Statistics Canada, conducted the data analyses, under the direction of the authors. His assistance on this project is gratefully acknowledged, as is that of Delaine Jodoin (University of Alberta) who assisted in the production of the tables.

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1. Introduction

This research monograph uses National Graduates Survey (NGS) data collected in the 1990s to examine the degree of fit between post-secondary education and subsequent employment, using two different approaches.

- The first focuses on the match between the type of post-secondary program completed and the type of job obtained, using several different measures: (a) a simple measure determining whether the employer required a specific post-secondary credential or whether the educational program was specifically designed for the respondent's job; (b) a self-assessment of whether the respondent uses skills or knowledge from her/his program on the job; and (c) a derived variable combining responses to these two questions. In brief, this approach addresses the extent to which graduates' jobs are *"related to their field of study."*

- The second approach moves away from the "credential-job fit" orientation of the first, while elaborating and extending the "skill use on the job" dimension. It begins with graduates' self-assessments of their own skills (six different skill sets), and then goes on to examine their judgments regarding the extent to which these skills were acquired via formal education or training, and the extent to which these skills are used in their current job. Juxtaposition of these three sets of findings allows us to comment on variations across post-secondary programs and across labour market locations in (self-assessed) *"skill value-added from post-secondary education"* and (self-assessed) *"skill value-added used on the job."*

The two approaches reflect a subtle but important change over the past decade in the conceptualization of the role of higher education in preparing individuals for the labour market. Traditionally, the focus has been primarily on the program-job match. That is, it has been assumed that post-secondary programs provide students with a body of knowledge and a set of skills required in specific types of occupations. Hence, if graduates of specific programs find employment within related occupations, it is assumed that there is a good fit between their post-secondary education and their employment (and, by inference, that this post-secondary program is functioning well with respect to labour market demands).

More recently, employers, researchers, and policy makers have begun to speak about more generic employability skills (e.g., speaking, problem solving, or teamwork skills) that may be useful in a broader range of occupational settings. We know much less about the prevalence of such skills among post-secondary graduates, about the extent to which such skills are acquired in post-secondary programs, and about the extent to which they are used in different employment settings. This is so, in part, because questions addressing these issues have not, until recently, been included in surveys of the employment experiences of post-secondary graduates.

Since questions about portable employability skills were first included in the 1995 NGS (the "class of 1995" surveyed in 1997), this data set is used to examine the generic skills approach. The program-job match approach is explored using data from the 1990 NGS (the "class of 1990" surveyed in 1992), since the relevant questions included in that survey were designed with this perspective in mind. Thus, a key assumption underlying the comparison of the two approaches is that the "class of 1990" and the "class of 1995" can be treated as equivalents, even though the labour market for post-secondary graduates was somewhat tighter in 1995. In other words, we must assume that if the "class of 1995" had been asked the program-job match questions, they would have responded in the same way as their counterparts did five years earlier.

Part 2 of this study consists of a literature review commenting on the importance of job-education skill match in today's economy, the manner in which "skills" have been defined and measured in previous research, and the conclusions emerging from such research on job-education skill match among post-secondary graduates.

Part 3 describes the National Graduates Surveys in terms of their basic design, their sampling strategies, and skill measurement approaches. This section also profiles the sample used in the study, comparing the "class of 1990" and the "class of 1995" by type and level of education, and field of study. In addition, it outlines the employment situation of the two cohorts, two years after the members of each received their post-secondary credentials.

Part 4 presents detailed results from our analysis of the 1990 NGS, while Part 5 does the same for the 1995 NGS. In both sets of findings, we begin by asking about the degree of education-job skill match (defined in different ways, as noted above) observed across four types/levels of

education (trade/vocational and career/technical programs, and university undergraduate, masters level, and doctoral level programs). We also look at education-job skills match from the perspective of the labour market, focusing on occupation and employment status variations. This analytic approach is premised on the assumption that education-job skills match could depend on at least two factors – skill training acquired in different post-secondary programs, and skill requirements within different segments of the labour market. Our analyses of the 1990 NGS results (Part 4) and the 1995 NGS results (Part 5) both conclude with a multi-variate analysis of the determinants of education-job skills match, with post-secondary program, labour market, and respondent characteristics as independent variables.

Part 6 summarizes the findings presented in the previous sections, comments on the relevance of these findings to current public policy debates about the role of post-secondary educational institutions in today's economy, and provides some suggestions for further research.

2. Review of Relevant Research

2.1 The Role of Post-secondary Education in Today's Economy

The fit between post-secondary education and training and subsequent employment outcomes has long been a concern among policy-makers and educators (Axelrod, 1982; Anisef and Axelrod, 1993; McKillop, 1994). Throughout the latter half of the twentieth century, the general demand for skilled labour has remained strong, but the specific needs of the labour market have shifted with the growth of the service economy. Periodic reports about how the post-secondary education system should respond to shortages of skilled blue-collar workers have been replaced with discussions of how best to equip Canadian workers with the skills required in an emerging information-based economy (Ontario Premier's Council, 1990; Porter and Company, 1991; British Columbia Task Force on Education and Training, 1991; Business Council on National Issues, 1992; Statistics Canada and OECD, 1995, HRDC and OECD, 1997).

Such debate has been fueled by technological advances that have significantly altered the way work is done in both the service and goods-producing sector and by increasing global competition from other "high tech" countries. The concern, quite simply, is one of becoming more competitive in the global economy by improving the stock of human capital in the Canadian labour force. At the same time, policy makers have been concerned about high rates of unemployment and underemployment, particularly among Canadian youth, and about how to retrain workers made redundant by downsizing and by industrial restructuring. In other words, how can the post-secondary system be used more effectively to match graduates with changing labour market demands?

Furthermore, over the past decade post-secondary institutions have been challenged to become more accountable, not only in how they spend public funds, but also with respect to how effectively they transmit knowledge and skills to their students (Smith Commission, 1991; Economic Council of Canada, 1992; Alberta Advanced Education and Career Development, 1995; Ontario Ministry of Education and Training, 1996; Corporate - Higher Education Forum, 1997). Colleges, technical schools, and universities are being asked to measure and report their success in satisfying students, training and educating them, and ensuring that they find

satisfactory employment (Evers and Gilbert, 1991; Association of Universities and Colleges of Canada, 1994). Media reports rank universities on these and other criteria (e.g., the annual Maclean's ranking of Canadian universities). Exit surveys asking graduates to evaluate their post-secondary education, and follow-up surveys enquiring about their post-graduation labour market experiences, are now part of the evaluation "tool kit" in many colleges and universities (Krahn and Silzer, 1995; Evers and O'Hara, 1996; Krahn and Lowe, 1998a).

Thus, the fit between post-secondary education and employment outcomes has become a central public policy concern. At the same time, there has been a shift in how the education-job fit is conceptualized. While many observers continue to evaluate post-secondary institutions primarily on their ability to train graduates for specific occupations, the argument that there is value in developing more generic, portable employability skills has also been gaining acceptance. In some versions of this argument, the emphasis is fairly narrow, with computer and "new technology" skills receiving the most attention. However, others have emphasized a wider array of creative thinking, problem solving, communication, information management, and people skills. For example, Human Resources Development Canada has initiated an Essential Skills Research Project (HRDC, 1998). Similarly, the Conference Board of Canada's *Employability Skills Profile* (Conference Board of Canada, 1992) has received a great deal of attention. As the debate about generic employability skills has intensified, so too have pressures on post-secondary institutions to ensure that their graduates possess such skills since, the argument goes, a strong economy is built on a skilled workforce.[1]

2.2 Definition and Measurement of Employment-related Skills

A review of the research literature reveals that "skill" has been conceptualized both as a characteristic of individuals and as a characteristic of occupations. Economists typically label the skills of individuals as human capital (Schultz, 1963; Becker, 1964; Psacharopoulos, 1973;

[1] Some authors address this debate more critically, arguing that while colleges and technical schools (and some professional faculties within the university system) are mandated to train graduates for specific occupations, universities also have other important functions, namely, creating knowledge in the arts and sciences, facilitating "pure research" in both the natural and social sciences, and encouraging debate about social issues. In addition, some critics argue that a strong economy requires not only investments in education and training but also policies designed to create jobs and enhance their skill requirements, and that the "skill shortage" may be over-stated. See, for example, Newson and Buchbinder (1988), Green and Ashton (1992), Brown (1994), Noble (1994), Osberg et al. (1995), Reading (1996), Emberley (1996), Taylor (1997), Krahn (1997), Jarman and Blackburn (1997).

Stager, 1996). Sociologists tend to define skill as an inherent feature of jobs, often writing about aggregate changes in occupational skill levels over time (e.g., Bell, 1963; Braverman, 1974; Myles, 1987). Obviously, both perspectives have value since, over time, the skills of individuals and the skill requirements of jobs are inter-related. However, in this study which focuses on the fit between education and employment outcomes in a particular period of time (the 1990s), an emphasis on the skills of post-secondary graduates, and how they are used in their jobs, is most useful.

The "skills" research literature can also be classified according to how skills are measured, that is, either by *direct*, *indirect*, or *non-measurement* approaches (Spenner, 1983, 1990). *Non-measures*, based on shifts over time in the proportion of blue collar and white collar occupations, for example, are least useful, since they rely on untested assumptions about the presumably higher skill requirements of white collar occupations (and the presumably higher skills of white collar workers). *Indirect measurement* approaches typically use educational attainment as a proxy for skill. Again, this approach relies on a critical assumption, namely, that additional education means greater skill acquisition. *Direct measures* of skill are obviously preferable, since they can be used to test the assumption that skills are enhanced through higher education. Furthermore, when using direct measures, researchers are forced to define specific skills (or skill requirements of jobs) more clearly.

Direct measures of workers' skills (or skill requirements of jobs) may involve observations or measurements by outsiders (e.g., researchers measuring workers' skills, or observing the skills required in a particular job) or may take the form of self-reports from individual graduates or workers. For example, occupational taxonomies such as the *Canadian Classification and Dictionary of Occupations* (Canada, 1971) and the *Canadian National Occupational Classification* (Canada, 1993) are based on the observations of occupational skill requirements by outside researchers. Alternatively, a number of recent surveys of workers and/or graduates, including the 1995 National Graduates Survey examined in this report, have relied on self-report measures of skill level and skill use on the job.[2]

[2] Other examples include the Making the Match Study (Evers et al., 1998; Rush and Evers, 1986; Evers et al., 1990), the CEASE Project (Evers and Gilbert, 1991), the Edmonton School-Work Transition Study (Krahn and Lowe, 1993, Redpath, 1994), and a variety of post-secondary "exit surveys" and employment outcome surveys (Evers and Gilbert, 1991; Evers and O'Hara, 1996; Krahn and Lowe, 1998a).

Objective measures of skills would obviously be preferable over self-reports, since the former should be more reliable.[3] For example, compared to self-report measures, the objective literacy tests used in the 1994 International Adult Literacy Survey provided a much more reliable and valid assessment of the literacy skills of Canadians (Statistics Canada and OECD, 1995; Human Resources Development Canada and OECD, 1997; Krahn and Lowe, 1998b). However, objective tests are extremely costly and time-consuming. As a result, most recent research on skill acquisition and skill use has relied on self-report data.[4]

Previous analyses of National Graduates Survey data (reviewed briefly in the following section of this report) have employed general self-report measures of skill use on the job (along with other measures of credential requirements on the part of employers) to create a derived variable measuring how closely graduates' jobs are "related to their field of study." In general, this derived variable appears to have reasonable concurrent validity, in that it indicates a "closer fit" for occupations and employment settings where one would expect the skills of post-secondary graduates to be required. Similarly, self-report measures of under-employment (or "over-qualification) vary systematically across occupations and employment settings in a predictable manner (Krahn and Lowe, 1993; Redpath, 1994; Kelly et al., 1997). Thus, while not as desirable as objective tests of skill level and skill use, self-report measures do exhibit a reasonable degree of validity.[5]

Previous studies of education-job fit that distinguished between program-specific skills (e.g., lab techniques, computer programming, translating) and general skills acquired in an educational program (e.g., writing ability, problem-solving skills, thinking skills) have shown interesting variations across fields of study (Krahn and Lowe, 1993; Krahn and Lowe, 1998a). Graduates of professional and occupationally-specific programs (e.g., engineering, nursing) are much more likely to report a close fit between their program of study and the use of specific skills, compared

[3] Gilbert and Bloom (1998) discuss some of the more critical "issues in measuring and assessing employability skills."

[4] Pike (1995, 1996) suggests that self-reports of skill development must be used cautiously. While they can serve as general indicators of skill enhancement, they are not a perfect substitute for objective testing.

[5] In its Essential Skills Project, Human Resources Development Canada is conducting interviews with approximately 3000 workers about what they actually do in their job (Mair, 1997). Results from this innovative study will be useful in assessing the validity of self-report measures about "skill use on the job" such as those employed in the National Graduates Survey and other similar studies.

to graduates of general arts and science programs, for example. However, program differences are much less pronounced with respect to use on the job of general skills acquired from post-secondary education.

Furthermore, university graduates' responses to a set of questions about on-the-job use of a range of different skills (e.g., writing, problem-solving, teamwork) reveal that some skills are much more likely to be used than others (Krahn and Lowe, 1998a). In addition, differences by program of study and by occupation are substantial. Thus, in contrast to single self-report measures intended to encompass a broad array of skills, sets of self-report questions focusing on a range of different skills may provide a clearer picture of education-job match among post-secondary graduates.

Even so, there is reason to proceed cautiously in this direction, since graduates may not have a clear sense of the meaning of some concepts used in such studies. For example, an analysis of test-retest reliability for a set of "skill use on the job" questions included in a recent survey of Alberta university graduates demonstrated a much higher degree of reliability for speaking, writing, and computer skills, compared to teamwork and "working independently" skills (Krahn and Lowe, 1998c).

Finally, a variety of different student surveys, "exit surveys," and employment outcome surveys (including several cycles of the National Graduates Survey) have included questions about skill acquisition from post-secondary programs (Evers and O'Hara, 1996; Grayson, 1996; Krahn and Lowe, 1998c). Questions asking about the extent to which general or specific skills have been enhanced as a result of post-secondary education are fairly common. In addition, both general and specific questions about skill use on the job have been included in a number of graduate surveys over the past decade. However, what has typically been absent is a set of questions asking graduates to evaluate their own skills. Without "skill level" measures, survey questions about skill acquisition (from post-secondary education) and skill use (on the job) cannot provide us with a complete understanding of patterns of education-job fit among post-secondary graduates.

2.3 Previous Research on Job-Education Skills Match

National Graduates Survey findings based on a derived variable measuring the closeness of fit between post-secondary graduates' programs of study and their jobs several years later have generally revealed that a majority believe that their jobs are either partly related or directly related to their education (Clark et al., 1986; Barr-Telford et al., 1996; Little and Lapierre, 1996; Bowlby, 1996). Nevertheless, outcomes have varied by type of post-secondary education (career/technical, trade/vocational, university), level of study (bachelor's, masters, doctoral), field of study, gender, and type of work (full-time/part-time), as well as time spent in the labour market after graduating (2 years versus 5 years).

For example, findings for 1982, 1986 and 1990 graduates reveal that across all levels and types of education, graduates working full-time were more likely than part-time workers to be in jobs that were directly or partly related to their program of study. Also, among university graduates, the higher the degree (e.g., masters or doctoral degrees versus bachelor's), the more likely graduates were to be working in directly related jobs. Across all types of post-secondary education, trade/vocational graduates were consistently more likely to be working in unrelated jobs both two years and five years after graduating. It is noteworthy that graduates of health science programs, whether in a university or in a community college or trade school, were typically more likely to be working in directly or partly related positions.

While somewhat similar questions about job-education fit have been included in the various National Graduates Surveys conducted in the 1980s and 1990s, no systematic over-time comparison of results has been completed to demonstrate whether or not the degree of job-education fit has been changing over time. Furthermore, different analyses have used different "field of study" classifications, so over-time comparisons are difficult to make. Sets of questions focusing on different types of skills were not included until recently, and the trio of skill level, skill acquisition, and skill use questions was not introduced until the 1995 NGS. Hence, it has not been possible to paint the complete picture of how post-secondary education enhances different types of skills, how such "skill value-added" is used in the workplace, and how these relationships vary by level of education and field of study.

The research reviewed above focuses on mismatch. The fact that a graduate is in a job that is not very related to her/his field of study need not indicate that this is a low-skill job. However, other research on the extent of self-reported under-employment (or "over-qualification") among Canadian post-secondary graduates reveals that employment in low-skill jobs may be a serious problem for a large minority of graduates. In the 1994 General Social Survey, more than one-fifth of post-secondary graduates indicated that they were overqualified for their jobs (Kelly et al., 1997). A 1997 survey of over 6000 Alberta university graduates showed that, two and one-half years after graduating, 26% of those no longer participating in the post-secondary education system felt overqualified for their job (Krahn and Lowe, 1998a). Other smaller-scale Canadian studies of job-education match among post-secondary graduates reveal similar findings (Krahn and Lowe, 1993; Redpath, 1994).[6]

Previous research has typically collected information from graduates, about their skill acquisition and skill use. But it has not included information from employers. The costs of collecting such information for a huge sample of post-secondary graduates would be prohibitive. However, a smaller-scale, longitudinal study conducted in Ontario by Evers and Rush has provided some very useful information (Rush and Evers, 1986; Evers et al., 1998). The *Making the Match* project compares the supply of skills brought to the workplace by university graduates with the demand for certain skills required in today's labour market. The researchers found that self-report ratings of "managing self" (e.g., learning, organizational skills, problem solving) and "communicating" were consistently higher than equivalent ratings of "managing people and tasks" (e.g., coordinating, decision making, leadership) and "mobilizing innovation and change" (e.g., conceptualizing, creativity, visioning). These skill rankings were also confirmed by the managers who supervised these graduates in the workplace. One of the main conclusions of this study is that the skills which are in greatest demand today (e.g., "managing people and tasks" and "mobilizing innovation and change") are also those least often found among university graduates. In addition, the study highlights the need for additional research on education-job skills match, from the perspective of employers and industry representatives as well as that of students and graduates.

[6] See, also, Krahn (1997) and Krahn and Lowe (1998b) for a discussion of the extent to which highly literate Canadian workers are able to use their literacy and numeracy skills in the workplace.

Several general conclusions emerge from this overview of previous Canadian research on education-job fit. It is very apparent that the higher the level of education, the better the fit, as indicated by traditional measures of how closely jobs are related to graduates' fields of study. Comparisons across fields of study indicate that graduates from professional programs, and from programs targeting specific occupations, are more likely to report a good education-job fit. This is not all that surprising, of course, since some professional occupations can only be entered with a specific post-secondary credential.

It is also clear that more discriminating measures of skill portray a more complex picture. Depending on the skill in question, and on how the questions are asked, we might draw quite different conclusions about the extent to which post-secondary programs develop useful employment-related skills. Thus, there is merit in undertaking a detailed analysis of results from recent National Graduates Surveys, particularly the two surveys completed in the 1990s. These two surveys offer a unique opportunity to examine the issue of education-job fit from two very different perspectives, that is, the "credential-job fit" approach and the "skill value-added" approach.

2.4 Research Questions

The previous discussion highlights the importance of the following sets of general research questions. The first set is addressed with an analysis of the 1990 NGS, while the remaining questions are answered with analyses of the 1995 NGS.

- What proportion of employed post-secondary graduates indicate that their employers required a specific educational credential? What proportion report their current jobs to be directly, partly, or not related to their program of study? How does the degree of education-job fit, measured in this manner, vary by type and level of post-secondary education, field of study, occupational outcomes, and employment in standard versus non-standard jobs (i.e., part-time or temporary jobs)?

- How do Canadian post-secondary graduates assess their own writing, critical thinking, problem solving, teamwork, and leadership skills, as well as their ability to learn and use new

technologies? How much variation do we observe by type of skill, type and level of post-secondary education, and field of study?

- To what extent do post-secondary graduates attribute their skills to their education and training? How does this vary by type of skill, type and level of education, and field of study? In brief, how much "skill value-added" is being generated by Canadian post-secondary institutions?

- To what extent do post-secondary graduates use these skills in their current job? How much variation do we observe by type of skill, type and level of education, field of study, occupational outcomes, and standard versus non-standard work?

- How much "skill value-added" is being used on the job by Canadian post-secondary graduates? In other words, what can we learn about the development and use of employment-related skills by juxtaposing survey results measuring skill levels, skill acquisition from post-secondary education, and skill use on the job? How much does "skill value-added used on the job" vary by type and level of education, field of study, occupational outcomes, and standard versus non-standard work?

- What additional insights about the relationship between post-secondary programs and employment outcomes are gained by examining the acquisition and on-the-job use of generic employability skills, compared to what we learn using more traditional measures of the fit between specific programs of study and specific occupations? Do the two approaches lead to similar conclusions about the effectiveness of different post-secondary programs in preparing graduates for the labour market?

3. Research Design and Measurement

The National Graduates Surveys

The National Graduates Surveys (NGS), sponsored by Human Resources Development Canada and conducted by Statistics Canada, are specifically designed to obtain information on the relationship between education/training and labour market activities, the long-term labour market experiences of graduates, the employment, earnings, occupation and additional educational experiences and qualifications of graduates. The NGS focus on individuals who had obtained a degree, diploma or certificate from a trade/vocational school, a career/technical college (or CEGEP) or a university, and who were still living in Canada at the time of the survey. The NGS files are representative of the underlying graduate population in Canada.

Background

Statistics Canada conducted a first survey in 1978 on the labour market experiences of 1976 graduates from universities and community colleges in Canada. In 1984, a similar survey, the NGS of 1982 graduates was sponsored jointly by the Department of the Secretary of State and Employment and Immigration Canada and conducted by Statistics Canada. This survey expanded on the content of the previous survey and extended the population base to include graduates of trade/vocational programs in addition to graduates from community colleges and universities.

Since 1982, four cohorts of graduates have been surveyed. Every cohort was interviewed two and five years after graduation.

Year of graduation	First interview	Follow-up interview
1982	1984	1987
1986	1988	1991
1990	1992	1995
1995	1997	2000

The 2000 Follow-up Survey of the 1995 Graduates included a 'brain drain' component. Those who graduated in 1995 but who were living in the United States in June 2000 were included in the survey.

Objectives

The survey's key data objectives are:

- To obtain information for labour market analysis;
- To obtain information on the relationship between education/training and labour market experiences and the exposure of graduates to additional learning opportunities;
- To extend available information required to improve occupational supply and demand projection models and to conduct related studies of supply-demand imbalances in the labour market;
- To extend available information required to improve occupational supply and demand projection models and to conduct related studies of supply-demand imbalances in the labour market;
- To obtain data regarding longer-term market experiences of graduates;
- To obtain information on labour market experiences of members of target groups (such as women, visible minorities, native people, and the disabled);

- To gain a better understanding of school-work transitions and returns to human capital;
- To gain a better understanding of post-secondary education financing;
- To obtain more detailed information on knowledge and skills.

Methodology

The National Graduates Surveys were based on a stratified systematic random sample design. For each province, the graduate population was stratified into five education levels: trade/vocational (skilled trades), career/technical (college), undergraduate, master's level and doctorate. The levels were subsequently stratified into nine fields of study for those who had taken a college program and ten fields for trade/vocational and university graduates. These fields of study classifications were based on the 5-digit USIS (University Student Information System) and CCSIS (Community College Student Information System) codes used by Statistics Canada. The sample allocation to the strata was made to assure acceptable levels of detail and therefore acceptable data reliability for the provinces, education levels and fields of study.

A total sample was selected for every cohort of graduates. Interviewers attempted to contact all graduates in the sample, initially using the telephone numbers provided by their institution. On average for every cohort, 73% of the total sample selected were contacted and interviewed. The same individuals were contacted again for the follow-up interview.

Year of graduation	Total sample selected	Year of survey	Usable sample (response rate)
1982	49,150	1984	35,717 (73%)
		1987	31,167
1986	53,136	1988	40,814 (77%)
		1991	35,401
1990	51,111	1992	36,280 (71%)
		1995	35,816
1995	61,759	1997	43,040 (70%)
		2000	To be completed

For more detailed information on methodology, see:

Clark, Warren, Margaret Laing and Edith Rechnitzer (1986). *The Class of 82: Summary Report on the Findings of the 1984 National Survey of the Graduates of 1982*, Secretary of State and Statistics Canada.

Clark, Warren (1991). *The Class of 1986: A Compendium of Findings of the 1988 National Graduates Survey of 1986 Graduates with Comparisons to the 1984 National Graduates Survey*, Employment and Immigration Canada and Statistics Canada, Catalogue LM-198E92.

Little, Don and Louise Lapierre (1996). *The Class of 90: A Compendium of Findings from the 1992 National Graduates Survey of 1990 Graduates*, Human Resources Development Canada and Statistics Canada, Catalogue SC-125-12-96E.

Taillon, Jacques and Mike Paju (1999). *The Class of '95: Report of the 1997 National Survey of 1995 Graduates*, Human Resources Development Canada and Statistics Canada, Catalogue SP-121-04-99.

3.1 Skills Measurement – 1990 NGS & 1995 NGS

The 1990 NGS addressed the issue of education-job skills match in several ways. In a set of questions about their "job last week" (May-June, 1992) all employed respondents were asked about the level of education needed to get the job. The next question asked: *"Did the employer specify that it (the job last week) must be in a specific field or fields of study?"* If the respondent answered "yes," she or he was asked: *"Was that your field of study?"* Those who answered "no" were asked: *"Was your job last week one for which your _____ program was designed?"* In a sense, the second question broadened the net cast by the first. Even if an employer had not specified a particular post-secondary credential at the time of hiring, the respondent could still indicate that her/his program had been designed for just such a job.

The 1990 NGS then went beyond these questions about job-credential fit to ask about use on the job of skills acquired from the respondent's post-secondary program: *"In this job, to what extent did you use any of the skills and knowledge acquired from the _____ program?"* Responses to this forced-choice question, along with information obtained about credential-job fit (see above) have been used in previous publications (e.g., Clark et al., 1986; Barr-Telford et al., 1996; Little and Lapierre, 1996; Bowlby, 1996) to construct a derived variable measuring how closely graduates' jobs are "related to their field of study." A similar analysis is presented in Part 4 of this report.

The 1995 NGS approached the issue of job-education skills match in more detail by focusing on six distinct skill sets: *(1) writing clearly and concisely; (2) analyzing or thinking critically; (3) solving problems effectively; (4) working effectively with others; (5) ability to lead or supervise others*, and *(6) ability to learn and use new technology*. The 1995 NGS also went beyond previous studies by asking three questions about each of these skill sets. The first asked respondents to assess their skill level (in writing clearly and concisely, for example), the second asked about the extent to which this skill had been acquired in the respondent's education or training, and the third asked those currently employed about the extent to which they used this skill in their current job.

3.2 Categorizing "Fields of Study"

The sampling design for both the 1990 and the 1995 NGS included graduates from four different types/levels of education: (1) trade/vocational and career/technical programs; (2) university undergraduate programs; (3) university masters programs; and (4) university doctoral programs. The following specific "fields of study" were identified for detailed comparisons of education-job skills match among trade/vocational and career/technical graduates, and among graduates of university undergraduate programs. With a few exceptions, this "field of study" typology reflects the classification system used in other NGS publications (e.g., Little and Lapierre, 1996: 10).

Trade/Vocational Programs and Career/Technical Programs	University Programs
Business and commerce	Commerce, management and administration
Arts and humanities	Fine and applied arts Humanities
Social sciences and services	Social sciences Law
Natural sciences and primary industries	Agriculture and biological sciences Mathematics and physical sciences
Engineering and applied sciences Health sciences and related	Engineering and applied sciences Medicine and dentistry Other health professions Education

In the university undergraduate sub-sample, a small number of recipients of general "Arts and Science" degrees were omitted from the analysis because of the decision to separate Arts graduates and Science graduates into several distinct "field of study" categories. Law degrees were separated from other social science degrees (where they are often classified) since the former are second (undergraduate) degrees. Furthermore, lawyers enter a very specialized labour market closed to all other social science graduates. Similarly, because doctors and dentists enter a closed labour market, recipients of medicine and dentistry degrees were distinguished from those receiving other health profession degrees.

Many fewer people graduate from university masters and doctoral level programs than from university undergraduate programs or from trades/vocational and career/technical programs. Consequently, fewer categories were used to examine "field of study" differences in education-

job skills match among recipients of graduate-level degrees. Masters-level programs were combined into five categories (see below) on the basis of general similarities in subject matter and skills training, while Ph.D. programs were combined into three broad categories.

University Masters Programs	University Doctoral Programs
Commerce, management and administration Fine arts, humanities and social sciences	Commerce/arts
Biological and physical sciences, engineering	Science/health
Health professions Education	Education

3.3 Studying Education-Job Skills Match Among Non-students

Most previous studies of education-job skills match using NGS data have included all currently employed sample members in the analysis, whether or not they were still participating in the post-secondary educational system. However, other research has demonstrated a growing trend over the past several decades, namely, many post-secondary students are active participants in a "student labour market" characterized by lower-skill, part-time jobs (Sunter, 1992; Krahn, 1996; Lowe and Krahn, 1999).

Including these "student" respondents in the analysis could leave us with an inaccurate picture of the relationship between different programs of study and employment outcomes, particularly since graduates of some programs (e.g., the humanities, fine arts, social sciences, and biological sciences) are much more likely to continue their education after a first degree or diploma (Krahn and Lowe, 1998a). Thus, in this report, only those NGS respondents not participating in the post-secondary education system at the time they were surveyed are included in the analysis.

For the 1990 NGS, individuals who answered "yes" to the question: *"During (the last week of October 1991) were you enrolled in any credit courses at an educational or training institution?"* were omitted from the analysis, along with those who were working part-time when surveyed (in June 1992) and who acknowledged that they were doing so because they were attending school.[7] For the 1995 NGS, "current students" were identified by responses to the

[7] It is possible that some sample members who had been attending school six months earlier (in October, 1991) were no longer students when surveyed in May-June, 1992, and vice versa. However, the 1990 NGS did not contain questions that would allow a more precise identification of student status at the time of the interview. The additional

question *"Last week, were you enrolled in any credit courses at an educational or training institution?"* [8]

Appendix Table A1 shows why it is important to limit the analysis of education-job match to "non-students." This table displays, across type/level of education and fields of study, the proportion of graduates enrolled in an educational program at the time they were surveyed (two years after graduating). Compared to graduates of trade/vocational and career/technical programs, it is clear that higher proportions of university graduates, particularly those from undergraduate programs, are still in the post-secondary education system two years after receiving their degree.[9] In addition, there are large variations within these categories. For example, focusing on the "class of 1995," 36% of agricultural and biological science graduates were still "students" two years after receiving their first degree, in contrast to only 18% of engineering and applied science graduates. If we were to leave such "students" in our analysis, their different proportions across fields of study (and type/level of education) could lead to invalid comparisons.

3.4 Number of Graduates – 1990 NGS & 1995 NGS

With "current students" excluded,[10] the weighted population for the 1990 NGS is 187,837, compared to 239,818 for the 1995 NGS database (Appendix Table A2). Over the course of five years, the size of the graduating class of Canada's post-secondary institutions increased considerably.[11] As one would expect, trades and careers graduates and graduates of university undergraduate programs accounted for over 90% of both the "class of 1990" and the "class of 1995." The two groups were of equal size in 1990, but in 1995, the proportion of trades and careers graduates had grown, while the size of the university undergraduate group had declined in

questions that would allow a more precise identification of student status at the time of the interview. The additional information about reasons for part-time work (in May-June, 1992) helps to sharpen the "student – non-student" distinction.

[8] Since the 1995 NGS was completed in May-June of 1997, it is possible that some individuals answering "no" may have been referring to the summer months, even though they might have been planning to return to complete a program in the autumn of 1997.

[9] Note, also, that the proportion increased between 1992 and 1997, for all four types/levels of education.

[10] See Appendix Table A1 for a small number of other cases excluded in both the 1990 and 1995 analyses.

[11] As noted above, this analysis is based on graduates who were no longer participating in the post-secondary system two years after receiving their degree. Hence, the graduating class was really somewhat larger than Appendix Table A2 indicates and our discussion in this section implies.

relative terms. In both cohorts, masters level graduates made up approximately 7% of the total graduating class, while recipients of doctoral degrees represented only 1% of the total.

Within the trades/vocational and career/technical category, engineering and applied science graduates were the largest group in both 1990 and 1995, followed by business and commerce graduates. The two groups accounted for over half of the non-university credentials awarded in both years (55% in 1990 and 58% in 1995). Over the five-year period, the business and commerce category increased from 24% to 29% while the health science category dropped from 18% to 13%. The relative decline in health science graduates may reflect the reduced demand for such credentials as health care cutbacks took place in many provinces during the early 1990s.

Appendix Table A2 also displays the proportion of university undergraduate degrees awarded in 1990 and 1995, as estimated by the two graduate surveys, across 11 different fields of study. There appears to have been little change in the proportions of graduates in these different fields of study over the five-year period. In both 1990 and 1995, social science and education graduates formed the two largest groups, each accounting for about one in five graduates of undergraduate programs. Commerce/management/administration graduates (14% in both years) formed the next largest group, followed by graduates of humanities programs (11% in 1990 and 12% in 1995), and engineering graduates (7% in both years). Overall, it is very apparent that many more "soft science" credentials (e.g., social sciences, humanities, commerce, fine arts) are awarded in undergraduate programs in Canada's universities, compared to "hard science" credentials (e.g., engineering, mathematics and physical sciences).

While recipients of masters degrees made up only 7% of all graduates in both 1990 and 1995, the total number of masters degrees awarded increased from 13,730 to over 16,000 during the five year period (Appendix Table A2). Fine arts/humanities/social science graduates accounted for one-third of all masters degrees in both years, while the commerce/management/administration and education categories each contained about 20% of masters level graduates.

Almost 2,400 doctoral degrees were awarded in 1995, up from 1,972 in 1990 (Appendix Table A2). However, in relative terms, the size of the Ph.D. category remained the same (about 1% in each cohort). Similarly, the proportion of doctoral degrees within each of the three broad

categories did not change, with science/health Ph.D. graduates accounting for over half of the total in both cohorts. Thus, while the "soft sciences" account for the majority of university undergraduate and masters level degrees, the pattern is reversed at the doctoral level where "hard science" degrees comprise the majority.

3.5 Employment Outcomes – 1990 NGS & 1995 NGS

It is important to look at the issue of education-job skills match both from the perspective of the post-secondary institutions where employment skills are presumably acquired and from the perspective of the labour market where they might or might not be used. Hence, it would be useful to profile the employment situations of the "class of 1990" and the "class of 1995," two years after the members of each cohort graduated.[12]

In 1992, two years after graduating, 85% of the 1990 trade/vocational and career/technical graduates were employed, compared to 90% of the university undergraduates, 92% of those who had received a masters degree, and 93% of the Ph.D. recipients. In 1997, the proportion of employed graduates had dropped slightly for all four groups, to 84%, 88%, 91% and 89%, respectively. Even so, in both years, post-secondary graduates reported a very high employment rate. By way of comparison, in 1992, 58.4% of all Canadians age 15 and older were employed (Statistics Canada, 1995). In 1997, the 58.9% were employed (Sunter and Bowlby, 1998).

Appendix Table A3 profiles the occupational distribution of employed graduates in both cohorts, using broad occupational categories based on the Standard Occupational Classification (SOC) system. For all types and levels of education, and in both time periods, there were more graduates working in "professional/managerial" occupations than in "clerical/sales/service" or "blue collar/other" occupations. This was particularly so for university graduates. While less than half of trade/vocational and career/technical graduates had acquired such occupations two years after graduating (i.e., 48% in 1992 and 39% in 1997), approximately three-quarters of bachelor's level graduates (78% and 74%) and virtually all masters level (93% and 91%) and doctoral level graduates (98% in both years) were in professional/managerial occupations.

[12] See Clark (1999) for a useful overview comparison of the employment experiences of 1982, 1986, 1990, and 1995 college and university graduates.

Appendix Table A4 provides another perspective on the type of employment obtained by post-secondary graduates, two years after leaving school. While the national part-time employment rate was 16.7% in 1992, post-secondary graduates were less likely to be in part-time jobs. Furthermore, the higher the level of post-secondary education, the less likely graduates were to be working part-time. By 1997, the part-time employment rate had risen for all types of graduates, but their rates were still lower than the national average of 19% in that year.

A very small minority of post-secondary graduates were self-employed (Appendix Table A4), with somewhat higher proportions among university graduates, particularly those with advanced degrees. Between 1992 and 1997, the proportion of self-employed graduates increased only marginally. Compared to the national rate of multiple job-holding (5% in 1996),[13] the proportion of graduates holding more than one job when surveyed in 1992 was about twice as high, around 10%. By 1997, it had risen considerably, to around 15%.

Temporary employment (jobs with a specified end-date) appears to be the most common form of non-standard work among post-secondary graduates (Appendix Table A4). In 1992, the temporary employment rate ranged from 21% for trade/vocational and career/technical graduates to 39% among those who had received a Ph.D. Five years later, the temporary employment rate had changed little for graduates of non-university programs, but it had increased for university undergraduates (from 27% to 31%), graduates of masters programs (from 22% to 26%), and recipients of doctoral degrees (from 39% to 41%). Thus, while a small minority of all employed Canadians are in temporary jobs (12% in 1995),[14] roughly a third of recent university graduates hold such positions.

Thus, within two years of graduating, the vast majority of post-secondary graduates (current students excluded) find employment, and most are employed in managerial/professional jobs. Part-time employment and self-employment are less common among post-secondary graduates, compared to the employed population as a whole, but post-secondary graduates are more likely to

[13] Statistics Canada (1997), p. 5.

[14] This estimate, from Statistics Canada's 1995 Survey of Work Arrangements, includes seasonal work, temporary/contract positions, on call/casual employment, and employment with a temporary help agency (Statistics Canada, 1998: 44). The NGS simply asked whether the graduate's job was "*a permanent position or a temporary*

be working in multiple jobs and to be in temporary positions. The higher the level of education, the higher the employment rate, the higher the proportion in managerial/professional jobs, and the lower the proportion in part-time positions. However, this pattern is reversed for temporary employment – the higher the level of education, the higher the proportion of graduates in temporary jobs.

Comparing the "class of 1990" and the "class of 1995," it is apparent that the more recent cohort of post-secondary graduates entered a somewhat more difficult labour market. The percentage employed (two years after graduation) was marginally lower, and the proportion employed in professional/managerial positions had declined a bit. In addition, part-time and temporary employment had increased, as had the proportion of graduates holding more than one job. These labour market differences notwithstanding, a key assumption underlying the following analyses of alternative approaches to assessing education-job skills match is that the two cohorts of graduates can be treated as equivalents. In other words, we must assume that if the "class of 1995" had been asked the program-job match questions asked of the 1990 graduates, the patterns of variation across type/level of education and across fields of study would have been similar (although the overall level of education-job match might have changed).

position?" If the NGS had used a broader definition, the estimates of temporary employment among graduates would probably be even higher.

4. Educational Program-Job Match: 1990 NGS Results

4.1 "Credential Fit," "Skill Use," and "Job Related to Field of Study"

The fit between 1990 graduates' post-secondary programs and their jobs two years after graduation was examined with three different approaches. The first focused on whether the respondent's employer had attempted to hire graduates from her/his specific post-secondary program (or whether the graduate's program of study had been designed for this particular type of job). A derived variable was created to examine this "credential fit" between graduates' educational program and their current job (see discussion of skills measurement in Section 3 above). Variations in "credential fit" by type/level of education and by field of study are outlined in the first column of Table 1 below.

Sixty percent of trade/vocational and career/technical graduates and a similar proportion of university undergraduates (62%) indicated a "credential fit" for their current job (i.e., their employer had specified such a credential to be necessary, or their program had been specifically designed for this type of job). Masters (73%) and doctoral level (81%) university graduates were more likely to be in a "credential fit" employment situation. For trade/vocational and career/technical graduates, as well as university undergraduates, those in the health science field were most likely to report a credential fit (86% and 90%, respectively). At the university undergraduate level, engineering graduates were also very likely to be in this "fit" category (82%), but the same pattern was not observed for engineering and applied science graduates from non-university post-secondary institutions (only 54% were in a "credential fit" employment situation).

The second strategy used to examine education-job fit among 1990 NGS respondents relied on their self-assessments of the extent to which they used skills and knowledge from their program of study in their current job. The middle columns of Table 1 display variations in this general subjective measure of "skills use." Graduates of university doctoral programs were most likely to indicate that skills and knowledge acquired in their programs were used on the job "to a great extent" (77%), followed by masters level graduates (54%), trade/vocational and career/technical graduates (52%), and university undergraduates (42%). With the exception of Ph.D. programs,

Table 1 **Education-Job Fit (3 measures) by Education Level/Field of Study, 1990 NGS**

Education Level/Field of Study	Credential Fit	Skill/Knowledge Used on the Job (%)			Job Related to Field of Study (%)		
	% Yes	*great extent*	*some extent*	*very little / not at all*	*closely*	*partially*	*not at all*
Trade/Vocational and Career/Technical	***60***	***52***	***26***	***22***	***41***	***37***	***22***
Business and commerce	51	44	33	22	32	46	22
Arts and humanities	41	43	26	31	29	40	31
Social science and services	63	58	25	17	46	37	17
Natural science and primary industries	52	45	29	26	33	42	26
Engineering and applied science	54	42	28	30	32	38	30
Health sciences and related	86	77	15	7	71	22	7
University Undergraduate	***62***	***42***	***36***	***22***	***35***	***44***	***22***
Commerce, management and administration	61	41	40	19	34	47	19
Fine and applied arts	40	40	33	27	24	50	27
Humanities	35	32	36	32	20	48	32
Social sciences	44	26	42	31	18	50	31
Law	70	71	20	9	51	40	9
Agriculture and biological sciences	54	37	32	30	32	38	30
Mathematics and physical sciences	70	40	36	23	36	40	23
Engineering and applied sciences	82	37	45	18	34	48	18
Medicine and dentistry	68	93	6	1	63	37	1
Other health professions	90	70	24	6	66	28	6
Education	81	52	34	14	47	39	14
University Masters-level	***73***	***54***	***34***	***12***	***44***	***44***	***12***
Commerce/management/administration	68	47	43	9	36	55	9
Fine arts/humanities/social sciences	69	54	29	17	45	39	17
Biological and physical sciences/engineering	77	51	36	14	43	44	14
Health professions	77	70	21	9	58	33	9
Education	77	59	32	9	49	42	9
University Doctoral-level	***81***	***77***	***18***	***5***	***65***	***30***	***5***
Commerce/arts	81	79	16	5	67	28	5
Science/health	81	76	19	4	65	31	4
Education	76	78	16	5	62	32	5

Note: Because very few graduates answered "not at all" in response to the question: "*In this job, to what extent did you use any of the skills and knowledge acquired from the...program?*", this response was combined with "very little."

there was considerable variation by field of study in perceptions of skills/knowledge use on the job. For example, at the university undergraduate level, graduates of medicine/dentistry (93%), law (71%) and other health profession programs (70%) were highly likely to indicate that they used their university-acquired skills and knowledge "to a great extent." In contrast, only a minority of humanities (32%) and social science graduates (26%) answered in this manner. Health science graduates from trade/vocational and career/technical programs, and from university masters level programs, were also very likely to indicate that they used their skills and knowledge "to a great extent" (77% and 70%, respectively).

The third method for examining job-education fit among 1990 graduates involved a combination of the "credential fit" and "skills use" strategies discussed above. This approach improves upon the previous two since it takes into account both labour market requirements (i.e., employers' desire for specific credentials) and subjective assessments of actual skill use on the job. A derived variable – "job related to field of study" – was created by cross-tabulating responses to the two previous measures and then identifying three distinct response patterns (see Box 1).

Graduates previously identified as being in a "credential fit" employment situation who also indicated that they used skills and knowledge acquired in their post-secondary program "to a great extent" in their job, were classified as having a *closely related* job. Those in a "credential fit" situation who only used their skills "to some extent," as well as those who were not in a "credential fit" job but nevertheless felt that they used their skills "to a great extent" or "to some extent," were classified as having a *partially related* job. All others were classified as having jobs *not at all related* to their program of study.

Variations in responses to this "job related to field of study" variable are shown in the last three columns of Table 1. Four out of ten trade/vocational and career/technical graduates (41%) had acquired *closely related* jobs, while a slightly lower percentage of those from university undergraduate programs were in such jobs (35%). Once again, the higher the level of university education, the closer the job-education fit, as 44% of masters graduates and 65% of Ph.D. graduates were in *closely related* jobs. While one in five (22%) non-university graduates and university undergraduates were in jobs *not at all related* to their program of study, a smaller percentage of masters (12%) and doctoral level graduates (only 5%) were in this complete non-fit category.

Box 1

Construction of "Job Related to Field of Study" Variable, 1990 NGS

Credential fit (employer specified credential or program designed for job)

Use skills/ knowledge from program on the job	Yes	No
To a great extent	1	2
To some extent	2	2
Very little	3	3
Not at all	3	3

"Job Related to Field of Study" categories:

1. *Closely related* (credential fit & high skill use on the job)
2. *Partially related* (credential fit & moderate skill use or credential non-fit & moderate/high skill use)
3. *Not at all related* (credential fit/non-fit & low skill use on the job)

More detailed field of study comparisons reveal that, among trade/vocational and career/technical graduates, those from health science programs (71%) were most likely to be in *closely related* jobs. Graduates of other non-university programs were much less likely to be in this close fit category. For example, only 32% of engineering and applied science graduates had *closely related* jobs. At the university undergraduate level, graduates of other health profession programs (66%), medicine and dentistry (63%) and law (51%) were most likely to be in *closely related* jobs. In contrast, less than one in four fine arts, humanities and social science graduates were in this category. At the masters level, graduates with health profession degrees (58%) were most likely to be in *closely related* jobs, while about two-thirds of all Ph.D. graduates were in this close fit category.

It is apparent from Table 1 that as we move from the "credential fit" approach to the self-reported "skill use" measure and, finally, to the "job related to field of study" approach, the extent of job-education fit decreases across all types/levels of education. For example, while 60% of trade/vocational and career/technical graduates are in a "credential fit" employment situation, only 41% are in jobs *closely related* to their program of study. Obviously, conclusions about

education-job fit are dependent on how such a "fit" is defined and measured. If we accept that a measure combining both labour market demands and skill use is preferable over single measures of either "credential fit" or self-reported "skill use," then the "job related to field of study" results in Table 1 are likely to be more valid. The other two measures probably over-estimate the extent of job-education fit among recent post-secondary graduates. In particular, the "credential fit" approach simply indicates that certain occupations require specific credentials. It is forced to assume that individuals in such occupations use many or most of the skills acquired in their program, that such skills would not be used in other occupations, and that the same skills could not be obtained in other programs.

Table 2 displays variations in education-job fit by occupation. Graduates employed in professional/managerial occupations were much more likely than those in clerical/sales/service occupations and blue collar/other occupations to be working in jobs requiring their credentials (75%), in jobs which used their skills and knowledge extensively (57%), and in jobs that were *closely related* to their field of study (48%). Education-job fit was marginally higher in blue collar occupations than in clerical/sales/service occupations. Nevertheless, between 36 and 40% of graduates working in both of these occupational spheres indicated that they used skills and knowledge acquired in their post-secondary education "very little" or "not at all."

Graduates employed full-time, and those in permanent jobs, were more likely to report a close job-education fit (Table 2). For example, 67% of those in permanent jobs (as compared to 46% of temporary workers) were in a "credential fit" employment situation. Permanent employees were also more likely to report using skills acquired in their post-secondary education (49% versus 44% of temporary employees), and to be in a *job closely related* to their field of study (42% versus 28%). As well, self-employed graduates (54%) were somewhat more likely than paid workers (48%) to have jobs in which they used their skills and knowledge "to a great extent."[15]

[15] Self-employed respondents were not asked the question about "credential fit." As a result, the "job related to field of study" derived variable could not be constructed for self-employed graduates.

Table 2 **Education-Job Fit (3 measures) by Employment Characteristics, 1990 NGS**

	Credential Fit	**Skill/Knowledge Used on the Job (%)**			**Job Related to Field of Study (%)**		
	% Yes	*great extent*	*some extent*	*very little / not at all*	*closely*	*partially*	*not at all*
*Occupation**							
Professional/Managerial	75	57	32	11	48	41	11
Clerical/Sales/Service	33	28	32	40	18	42	40
Blue Collar/Other	42	36	27	36	25	39	36
Part-time	52	43	25	31	33	36	31
Full-time	63	49	32	19	39	41	19
Paid workers	65	48	32	21	41	39	21
Self-employed**	--	54	26	20	--	--	--
Permanent	67	49	32	18	42	40	18
Temporary	46	44	28	29	28	44	29

* Source of occupational categories: Standard Occupational Classification, Statistics Canada, Minister of Supply and Services Ottawa, 1981.

** Individuals who were self-employed were not asked the "Credential-fit" questions. Hence, the "Job Related to Field of Study" variable could not be constructed.

4.2 Program, Labour Market and Personal Determinants

To this point, our analysis has been bivariate in design, involving cross-tabulations of three different measures of education-job skills match by type/level of education and field of study (Table 1) and by labour market locations (Table 2). However, we also know that graduates of different types of post-secondary programs are unequally distributed across labour market locations (e.g., health science graduates are more likely to be employed in professional/managerial occupations; engineering graduates are less likely to be working part-time – see Appendix Tables A3 and A4). It is also likely that there are gender and age differences among graduates from different types of programs. Work experience prior to entering a post-secondary program, as well as participation in co-operative education (programs that involve alternating periods of paid work and study), might improve the chances of graduates finding employment that matched their training. Hence, a multivariate analysis of the determinants of education-job skills match that examines the net effects of program of study (while controlling on labour market and respondent characteristics) is needed.

We have restricted our multivariate analysis to two groups of graduates, those from trade/vocational and career/technical programs (Table 3) and university undergraduates (Table 4). These two groups constitute a very large majority of all post-secondary graduates (92% in both 1990 and 1995). Furthermore, our analysis to this point (Table 1) has indicated a much higher likelihood of education-job skills match among university masters and doctoral level graduates. Hence, there is more to be learned from focusing on the sub-samples where such a match is not as widespread.

Two of the three dependent variables examined in Tables 1 and 2 are used in the following analyses. The first is a binary measure (1,0) of whether or not a graduate was in a "credential fit" type of job in 1992. The second, also a binary measure, indicates whether or not a graduate was in a job *"closely related"* to her/his field of study. A logistic multiple regression procedure was used to estimate the net effects of the various independent variables on these two indicators of education-job fit. In such an analysis, multi-value independent variables (e.g., occupation) are transformed into a set of binary variables (e.g., professional/managerial; clerical/sales/service; blue collar). These sets of binary variables (with one variable excluded as a "reference category")

are included in the multiple regression equation along with other predictors already in a binary format (e.g., gender; prior full-time work experience).[16]

The odds-ratio estimated for each binary predictor variable indicates how much more or less likely individuals in a particular category (e.g., professional/managerial occupations) are to be found in a education-job fit situation, compared to individuals in the reference category (e.g., blue collar occupations), controlling on the potentially inter-related effects of all the other variables in the equation. An odds-ratio of 2.0, for example, would indicate that a particular group of graduates was twice as likely as those in the reference category to be in an education-job fit situation. An odds-ratio less than 1.0 would indicate a lower probability of education-job fit, compared to the reference category.

Table 3 profiles the net effects of post-secondary program, respondent characteristics, and labour market characteristics on the two education-job fit measures for the non-university sub-sample of 1990 graduates. Beginning with the "credential fit" results, the first equation containing only "field of study" predictors tells the same story told by the bivariate analyses in Table 1. Health science graduates have been omitted as the reference category since they were most likely to be in a "credential fit" type of job (see Table 1). The odds-ratios in Table 3 indicate that, compared to health science graduates, all other graduates were much less likely to be in jobs that required their post-secondary credentials. As already observed in Table 1, arts/humanities graduates were least likely to be in a credential-fit type of job.

When respondent and labour market characteristics are added to the analysis (equation 2), the differences between health science and other types of graduates shrink to some extent (the odds-ratios are now higher, but still less than 1.0). Furthermore, the relative ranking of the field of study predictors shifts. For example, in the first equation, graduates of natural science/primary industry programs had one of the lower odds-ratios. In the second equation, these graduates have the highest odds-ratio, although a value of 0.454 still indicates that, compared to health science graduates, these individuals were considerably less likely to be in a job requiring their specific credentials. These changes in the odds-ratios for field of study predictor variables indicate that at

[16] For both the 1990 and the 1995 NGS analyses, prior full-time work experience was defined as having ever worked full-time for at least six consecutive months for the same employer prior to completing the post-secondary program of study.

least some of the field of study differences in employment outcomes are a function of other factors.

Controlling on other predictors in the equation (including field of study variables), males were significantly more likely to be in jobs requiring their credentials, while individuals with prior labour market experience were less likely to be in such jobs. However, labour market characteristics have a more prominent effect than do respondent characteristics. Specifically, controlling on other predictor variables, individuals in professional/managerial occupations are more than twice as likely to be in a "credential fit" type of job (an odds-ratio of 2.812) compared to those in blue-collar jobs. Those employed in the upper tier service industries (e.g., business services, education and health services) are more than twice as likely as those working in the lower tier services (e.g., retail trade, accommodation and food/beverage services) to be in jobs requiring their credentials. Similarly, controlling on field of study, respondent characteristics, and other labour market factors, permanent employees are more than twice as likely as temporary employees to be in an education-job-fit situation.

Thus, in brief, the "credential fit" results in Table 3 indicate that field of study has an important impact on education-job fit for graduates of trade/vocational and career/technical post-secondary programs. At the same time, respondent characteristics and, particularly, labour market location also play significant roles in determining whether post-secondary graduates are in jobs requiring their credentials. The "job related to field of study" results in Table 3 essentially tell the same story. When looking only at field of study differences (equation 1), graduates of all other non-university programs are much less likely than health science graduates to be in jobs closely related to their field of study (the largest odds-ratio is 0.35, for social science/service graduates). When other factors (labour market and respondent characteristics) are statistically controlled, the difference between health science and other graduates declines to some extent. Males and older graduates are somewhat more likely than females and younger graduates to be in "closely related" jobs, controlling on all the other variables in the equation. Labour market characteristics have a larger impact, however. Graduates in professional/managerial jobs (compared to those in blue collar jobs), those employed in the upper tier services (compared to the lower tier services), and those in permanent jobs (compared to temporary positions) are much more likely to indicate

that their current job is closely related to their field of study (odds-ratios of 1.907, 1.72, and 2.099, respectively).

Table 4 repeats the same analysis for university undergraduates. For the "credential fit" dependent variable, compared to graduates from health profession programs (the reference category), all other graduates are much less likely to be in jobs requiring their specific credential (odds-ratios ranging from 0.06 to 0.53), a pattern we observed earlier in the bivariate results displayed in Table 1. When respondent and labour market characteristics are added to the analysis (equation 2), the field of study differences shrink, and the relative rankings shift somewhat, although health profession graduates are still most likely to be in an education-job-fit situation.

Labour market characteristics have a more prominent effect on "credential fit" than do respondent characteristics. In fact, university graduates in professional/managerial jobs are more than eight times as likely as those in blue-collar jobs to be in a job requiring their specific post-secondary credential. Compared to the lower tier services, the upper tier services and the goods producing industries are more likely to offer "credential fit" types of employment. And, once again, controlling on the other variables in the equation, graduates in permanent jobs are more than twice as likely as those in temporary jobs to report that their employer required their specific credential.

The "job related to field of study" results in Table 4 reveal a similar pattern. Field of study is an important predictor of education-job fit (equation 1), with graduates of health profession programs being most likely to indicate that their jobs are closely related to their field of study. But some of this "field of study" effect is due to other factors, since the field of study odds-ratios become larger (i.e., closer to 1.0) when respondent and labour market characteristics are added to the analysis (equation 2). When all of these factors are taken into consideration, we observe that university graduates in professional/managerial jobs (compared to blue collar jobs) and those in permanent jobs (compared to temporary positions) are significantly more likely to be in jobs closely related to their field of study.

Table 3 **Logistic Regression Results: "Credential Fit" and "Job Related to Field of Study" regressed on Field of Study, Respondent Characteristics, and Labour Market Characteristics; Trade/Vocational and Career/Technical Graduates, 1990 NGS**

Independent Variables	ODDS-RATIOS #			
	Credential Fit ("yes" = 1)		Job Closely Related to Field of Study ("yes" = 1)	
	Equation 1	*Equation 2*	*Equation 1*	*Equation 2*
***Field of Study** **				
Business and commerce	0.169	0.343	0.190	0.324
Arts and humanities	0.114	0.227	0.167	0.290
Social science and services	0.274	0.436	0.350	0.495
Natural science and primary industries	0.180	0.454	0.202	0.393
Engineering and applied science	0.194	0.440	0.197	0.351
***Respondent Characteristics** **				
Gender (male = 1)	--	1.327	--	1.268
Age 25 to 29	--	1.088 ~	--	1.180
Age 30 and older	--	0.912 ~	--	1.194
Prior full-time work experience	--	0.876	--	0.949 ~
Coop program graduate	--	-- @	--	-- @
***Labour Market Characteristics** **				
Professional/managerial occupations	--	2.812	--	1.907
Clerical/sales/service occupations	--	0.758	--	0.722
Goods-producing industries	--	1.668	--	1.285
Upper tier service industries	--	2.231	--	1.720
Part-time employment	--	0.552	--	0.603
Permanent employment	--	2.529	--	2.099
Concordance Rate	52.1%	75.1%	53.4%	72.2%

\# Odds-ratios compare (all other things being equal) specific characteristics or categories with a designated reference category (given a value of 1.0). For example, an odds ratio of 0.5 means that the odds of the characteristic or category under consideration are only half as high as the odds for the reference category.

* All independent variables coded as binary (1, 0) variables. "Health sciences and related" omitted as field of study reference category, "blue collar occupations" omitted as occupation reference category, "lower tier services" omitted as industry reference category, and "age 17 to 24" omitted as age reference category.

~ Not statistically significant ($p > .01$).

@ Coop program not included in regression analyses because of missing data for over one-third of the cases. The regression analyses were rerun with coop program included (and a smaller sample), but no important differences in the pattern of results were observed.

Table 4 **Logistic Regression Results: "Credential Fit" and "Job Related to Field of Study" regressed on Field of Study, Respondent Characteristics, and Labour Market Characteristics; University Undergraduate, 1990 NGS**

Independent Variables	ODDS-RATIOS#			
	Credential Fit ("yes" = 1)		Job Closely Related to Field of Study ("yes" = 1)	
	Equation 1	*Equation 2*	*Equation 1*	*Equation 2*
Field of Study *				
Commerce, management and administration	0.183	0.316	0.265	0.380
Fine and applied arts	0.078	0.155	0.161	0.264
Humanities	0.064	0.102	0.128	0.186
Social sciences	0.089	0.162	0.116	0.183
Law	0.271	0.345	0.544	0.644
Agriculture and biological sciences	0.137	0.305	0.241	0.429
Mathematics and physical sciences	0.267	0.390	0.297	0.350
Engineering and applied sciences	0.534	0.804 ~	0.268	0.293
Medicine and dentistry	0.251	0.338	0.875 ~	1.098 ~
Education	0.504	0.625	0.463	0.514
Respondent Characteristics *				
Gender (male = 1)	--	1.192	--	1.010 ~
Age 25 to 29	--	1.038 ~	--	1.046 ~
Age 30 and older	--	1.113 ~	--	1.207 ~
Prior full-time work experience	--	0.874 ~	--	0.874 ~
Coop program graduate	--	1.358 ~	--	1.308 ~
Labour Market Characteristics *				
Professional/managerial occupations	--	8.240	--	5.064
Clerical/sales/service occupations	--	0.965 ~	--	0.558 ~
Goods-producing industries	--	1.476	--	0.895 ~
Upper tier service industries	--	1.787	--	1.061 ~
Part-time employment	--	0.825 ~	--	0.873 ~
Permanent employment	--	2.214	--	1.725
Concordance Rate	65.7%	81.0%	61.2%	72.5%

\# Odds-ratios compare (all other things being equal) specific characteristics or categories with a designated reference category (given a value of 1.0). For example, an odds ratio of 0.5 means that the odds of the characteristic or category under consideration are only half as high as the odds for the reference category.

* See Table 3 for an explanation of reference categories used in this analysis. For university undergraduates, "other health professions" was omitted as the reference category for field of study.

~ Not statistically significant ($p > .01$).

5. "Skill Value-Added" from Education: 1995 NGS Results

The 1995 NGS approached the issue of education-job skills match from a different perspective, focusing on a set of six unique employment-related skills and including self-report questions on skill levels, skill acquisition, and skill use on the job. In this section of the report, we examine responses to these questions by type/level of education and field of study, and by employment location (for 1995 graduates employed when surveyed in 1997). By combining responses to the different questions, we construct measures of *"skill value-added from post-secondary education"* and of *"skill value-added used on the job"* for each of the six different skill sets. We then examine the distribution of these derived variables across type/level of education and field of study, and across different employment locations, before once again conducting a multivariate analysis of the net effects of field of study, respondent characteristics, and employment location.

5.1 Self-reported Skill Levels

Participants in the 1995 NGS were invited to assess *"some of the skills or abilities you may have developed either in school or at work."* Provided with response categories of "excellent," "very good," "good," and "not very good," they were asked about their ability to: (1) *analyze or think critically;* (2) *solve problems effectively;* (3) *write clearly and concisely;* (4) *work effectively with others;* (5) *lead or supervise others;* and (6) *learn and use new technology on the job.* Table 5 displays variations by education type/level and field of study in response to the "critical thinking," "problem solving" and "writing" questions. Table 6 presents similar findings for "teamwork," "leadership" and "use of new technology" questions.

In a sense, acquisition of the cognitive and communication "skills" examined in Table 5 (critical thinking, problem solving, writing) has always been seen to be an important outcome of university education (and of some programs in the trade/vocational and career/technical post-secondary sector). In contrast, Table 6 profiles social and applied "employability skills" that have begun to receive more attention in the past decade. While some post-secondary programs have always tried to develop such skills (e.g., leadership skills in business programs; use of new technology skills in engineering and applied science programs), the enhancement of these

Table 5 **Self-reported Skill Level: Critical Thinking, Problem Solving, and Writing Skills by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Critical Thinking (%)		Problem Solving (%)		Writing (%)	
	excellent	*very good*	*excellent*	*very good*	*excellent*	*very good*
Trade/Vocational and Career/Technical	***32***	***47***	***31***	***49***	***29***	***43***
Business and commerce	28	47	28	49	30	44
Arts and humanities	36	44	30	45	30	43
Social science and services	35	46	35	49	32	45
Natural science and primary industries	30	49	30	49	24	41
Engineering and applied science	33	46	33	49	25	40
Health sciences and related	31	50	30	52	31	48
University Undergraduate	***38***	***49***	***31***	***52***	***40***	***44***
Commerce, management and administration	34	52	28	56	30	49
Fine and applied arts	46	43	37	47	46	42
Humanities	38	47	25	56	55	36
Social sciences	34	53	29	52	36	50
Law	62	34	41	46	64	27
Agriculture and biological sciences	41	44	32	53	38	44
Mathematics and physical sciences	48	42	49	40	34	38
Engineering and applied sciences	43	45	38	50	28	45
Medicine and dentistry	47	43	42	48	39	47
Other health professions	33	53	30	54	32	48
Education	35	53	31	53	44	44
University Masters-level	***50***	***42***	***41***	***48***	***48***	***41***
Commerce/management/administration	56	39	51	41	49	40
Fine arts/humanities/social sciences	51	40	36	50	55	38
Biological and physical sciences/engineering	48	43	41	46	34	46
Health professions	44	46	41	50	44	44
Education	45	44	37	51	49	44
University Doctoral-level	***63***	***32***	***51***	***42***	***55***	***36***
Commerce/arts	70	26	50	41	67	30
Science/health	58	36	52	42	44	42
Education	67	29	51	39	68	26

Note: For each skill, 4 response categories were presented to graduates including "excellent," "very good," "good," and "not very good." Only findings from the first two categories are presented here.

Table 6 **Self-reported Skill Level: Teamwork, Leadership Skills, and Use of New Technology by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Teamwork (%)		Leadership (%)		Use of New Technology (%)	
	excellent	*very good*	*excellent*	*very good*	*excellent*	*very good*
Trade/Vocational and Career/Technical	***54***	***35***	***23***	***42***	***38***	***40***
Business and commerce	54	36	22	42	39	41
Arts and humanities	54	33	26	44	42	37
Social science and services	59	33	28	43	31	43
Natural science and primary industries	48	39	24	44	40	39
Engineering and applied science	51	35	20	39	42	40
Health sciences and related	59	35	20	42	34	41
University Undergraduate	***51***	***38***	***26***	***45***	***37***	***40***
Commerce, management and administration	48	39	22	48	45	41
Fine and applied arts	56	28	37	30	29	31
Humanities	48	36	24	44	33	39
Social sciences	53	38	25	47	33	41
Law	52	34	19	48	34	35
Agriculture and biological sciences	49	41	25	41	38	47
Mathematics and physical sciences	40	41	19	38	53	35
Engineering and applied sciences	42	42	17	45	46	40
Medicine and dentistry	55	39	21	40	27	52
Other health professions	52	39	20	48	33	47
Education	57	37	37	44	34	39
University Masters-level	***48***	***40***	***24***	***45***	***39***	***39***
Commerce/management/administration	46	42	23	50	48	35
Fine arts/humanities/social sciences	47	40	23	42	33	40
Biological and physical sciences/engineering	37	46	16	44	49	38
Health professions	52	38	21	48	34	45
Education	59	32	37	43	32	40
University Doctoral-level	***45***	***41***	***26***	***48***	***45***	***36***
Commerce/arts	47	37	29	48	37	36
Science/health	42	43	22	49	53	37
Education	54	38	40	43	36	35

Note: For each skill, 4 response categories were presented to graduates including "excellent," "very good," "good," and "not very good." Only findings from the first two categories are presented here.

employability skills among students has typically not been a primary goal in many post-secondary programs.

Virtually none of the 1995 NGS respondents rated their critical thinking or problem solving skills as "not very good" and very few chose the "good" response category. Instead, between 80 and 90% assessed their skills in these two areas as either "very good" or "excellent" (Table 5). The proportion of respondents assessing their critical thinking skills as "excellent" increases with type/level of education, from 32% for trade/vocational and career/technical graduates to 63% for Ph.D. graduates (Table 5).[17] As for problem solving skills, university undergraduates and respondents with non-university credentials are equally likely to rate them as "excellent" (31%), compared to 41% of masters level and 51% of doctoral level graduates. With respect to writing skills, we observe a systematic increase in the proportion of "excellent" responses across type/level of education, from 29% among trade/vocational and career/technical graduates, to 40% for university undergraduates, 48% for masters level graduates, and 55% for those who received doctoral degrees.

Table 5 reveals few field of study differences within the non-university group of graduates. But among university undergraduates there is some variation. Law, medicine and dentistry, and mathematics and physical science graduates are more likely to rate their critical thinking and problem solving skills as "excellent." Arts graduates, particularly from the humanities, are more likely to rate their writing skills positively, as are law graduates (many of whom would have entered law school with an arts degree).

The distributions of responses to the questions about teamwork and leadership skills are quite different (Table 6). While the differences are not large, we observe a negative relationship between type/level of education and self-assessed teamwork skills. Over half (54%) of trade/vocational and career/technical graduates indicate that their teamwork skills are "excellent," compared to 51% of university undergraduates, 48% of masters level graduates, and 45% of those who received doctoral degrees. As for leadership skills, the differences across type/level of education are negligible – about one in four graduates assess their leadership skills

[17] The validity of these education-level differences in self-reported critical thinking skills is supported by previous research showing college students scoring higher than individuals not attending college on objective tests of critical thinking (Pascarella, 1989).

as "excellent." What is more noteworthy is that, in general, the proportion of "excellent" responses is about twice as high for teamwork as for leadership skills. The "use of new technology" pattern of responses is somewhat different. Just under 40% of all graduates, with the exception of Ph.D. graduates (45%) assessed their skills in this area as "excellent."

Table 6 generally reveals few important differences by field of study for the teamwork and leadership questions. One of the few groups that do stand out are education graduates (at the undergraduate, masters, and doctoral level) who are somewhat more likely to evaluate these skills as "excellent." As for use of new technology, graduates of engineering and "hard science" programs within all types/levels of education were somewhat more likely to assess these skills as "excellent."

5.2 Self-reported Skill Acquisition from Post-secondary Education

While variations in self-assessments of skill are interesting on their own, our concern here is with the extent to which graduates attribute their skills to their post-secondary education. After assessing their skill level in each of the six areas described above, 1995 NGS respondents were asked: *"to what extent did you get this ability from your education or training?"*[18] The distributions of graduates' responses (to a great extent, to some extent, very little, not at all) by type/level of education and by field of study are presented in Tables 7 and 8.

For critical thinking, problem solving and writing skills, we see a very systematic relationship with type/level of education (Table 7). For example, while only 29% of trade/vocational and career/technical graduates indicated that their critical thinking skills had been enhanced "to a great extent" by their education, 45% of university undergraduates, 49% of masters level graduates, and almost two-thirds (64%) of doctoral graduates chose this response category. Differences by field of study within type/level of education are not very systematic. However, for

[18] Since these follow-up questions did not specify "post-secondary education or training," it is possible that some respondents might have included their primary and secondary education when considering their response. Our analysis and discussion below is based on the assumption that most graduates were referring primarily to their post-secondary education and, that to the extent that some were not, these cases are randomly distributed across type/level of education and field of study.

Table 7 **Self-reported Skill Acquisition from Education: Critical Thinking, Problem Solving and Writing Skills by Education Level/Field of Study, 1995 NGS***

Education Level/Field of Study	Critical Thinking (%)		Problem Solving (%)		Writing (%)	
	to great extent	*to some extent*	*to great extent*	*to some extent*	*to great extent*	*to some extent*
Trade/Vocational and Career/Technical	***29***	***55***	***28***	***54***	***33***	***49***
Business and commerce	25	57	22	57	35	51
Arts and humanities	30	53	27	53	32	49
Social science and services	31	55	33	54	35	50
Natural science and primary industries	28	55	25	54	29	51
Engineering and applied science	27	54	28	53	29	48
Health sciences and related	39	51	37	50	38	44
University Undergraduate	***45***	***47***	***32***	***55***	***48***	***41***
Commerce, management and administration	38	55	33	56	43	47
Fine and applied arts	52	37	30	53	40	41
Humanities	45	49	22	58	61	35
Social sciences	51	43	28	59	53	41
Law	50	42	38	50	52	32
Agriculture and biological sciences	51	42	38	55	45	42
Mathematics and physical sciences	52	41	48	44	39	41
Engineering and applied sciences	48	46	51	42	36	45
Medicine and dentistry	54	44	55	41	38	41
Other health professions	43	48	39	52	41	46
Education	39	52	26	56	49	40
University Masters-level	***49***	***44***	***34***	***55***	***48***	***41***
Commerce/management/administration	48	46	41	52	41	48
Fine arts/humanities/social sciences	54	40	28	57	52	39
Biological and physical sciences/engineering	52	42	44	49	47	40
Health professions	51	42	37	53	45	43
Education	40	54	24	59	52	37
University Doctoral-level	***64***	***32***	***49***	***43***	***59***	***33***
Commerce/arts	67	30	43	46	65	27
Science/health	62	34	55	40	56	37
Education	60	33	38	50	59	33

Note: For each skill, four response categories were presented to graduates including "to a great extent," "to some extent," "very little," and "not at all." Only findings from the first two response categories are displayed here.

problem solving skills, graduates of university level "hard science" and health related programs were somewhat more likely to report that their education had improved this skill "to a great extent." For writing skills, arts graduates (humanities and social sciences) and law graduates (many with prior arts degrees) were more likely than other university undergraduates to state that their education had led to significant improvements.

Turning from these cognitive and communication skills to more social and applied skills, we do not always observe the same pattern (i.e., more positive responses from graduates of higher level institutions/programs). In fact, Table 8 shows that trade/vocational and career/technical graduates were somewhat more likely than university graduates, at all levels, to indicate that their education had improved their teamwork skills "to a great extent" (26% compared to 24%, 20%, and 21%). However, compared to all others, doctoral graduates were most likely to indicate that their ability to learn and use new technology had improved "to a great extent" (41% compared with 31%, 25%, and 29%). Differences by field of study in response to the teamwork and leadership questions are not all that large or systematic. However, it is interesting that commerce/management/administration graduates (at all levels) were no more likely than other graduates to report that their leadership skills had improved "to a great extent" as a result of their education. But, as we might expect, graduates of engineering and "hard science" programs were more likely to report that their skills in the use of new technology had improved "to a great extent" as a result of their education.

5.3 "Skill Value-Added" from Post-secondary Education

It is difficult to determine the extent to which post-secondary institutions develop employment-related skills when asking only about skill levels (Section 5.1 above) or only about the extent to which skills have been enhanced by education (Section 5.2). We can obtain a much clearer picture by combining responses to these two types of questions.

Table 8 **Self-reported Skill Acquisition from Education: Teamwork, Leadership Skills and Use of New Technology by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Teamwork (%)		Leadership (%)		Use of New Technology (%)	
	to great extent	*to some extent*	*to great extent*	*to some extent*	*to great extent*	*to some extent*
Trade/Vocational and Career/Technical	***26***	***43***	***18***	***44***	***31***	***48***
Business and commerce	25	42	17	43	33	47
Arts and humanities	30	40	16	47	32	47
Social science and services	32	44	25	46	24	50
Natural science and primary industries	22	44	18	42	30	50
Engineering and applied science	21	43	12	42	32	49
Health sciences and related	29	45	21	44	29	51
University Undergraduate	***24***	***45***	***16***	***44***	***25***	***44***
Commerce, management and administration	31	43	16	47	26	50
Fine and applied arts	32	44	22	42	18	42
Humanities	17	43	15	39	21	35
Social sciences	21	47	15	43	20	45
Law	16	35	8	35	15	38
Agriculture and biological sciences	22	47	18	36	32	47
Mathematics and physical sciences	22	45	11	42	39	45
Engineering and applied sciences	27	48	14	41	37	49
Medicine and dentistry	21	46	17	53	22	52
Other health professions	24	47	18	46	22	52
Education	26	46	21	48	25	41
University Masters-level	***20***	***48***	***15***	***44***	***29***	***40***
Commerce/management/administration	30	50	12	49	27	42
Fine arts/humanities/social sciences	16	47	15	41	25	38
Biological and physical sciences/engineering	20	46	14	40	43	44
Health professions	18	43	16	47	30	41
Education	19	50	20	48	24	36
University Doctoral-level	***21***	***47***	***22***	***43***	***41***	***38***
Commerce/arts	17	44	21	39	26	39
Science/health	23	50	23	45	54	37
Education	21	41	23	40	25	43

Note: For each skill, four response categories were presented to graduates including "to a great extent," "to some extent," "very little," and "not at all." Only findings from the first two response categories are displayed here.

Box 2 demonstrates how the "skill level" and "skill acquisition" questions were combined for each of the six skill sets, to create a set of *"skill value-added from post-secondary education"* derived variables. Graduates who rated their skill (in a particular area) as "excellent" or "very good" and who indicated that this skill had improved "to a great extent" as a result of their education were classified in the "very high" skill value-added category. Those who rated their skills equally positively but reported that they had improved only "to some extent" were placed in the "high" skill value-added category. Graduates who rated their skills merely as "good" but who stated that their education had improved these skills "to a great extent" or "to some extent" were categorized as "moderate" while all others were placed in the "low" skill value-added category.

Box 2

Construction of "Skill Value-Added from Education" Variables, 1995 NGS

Skill acquisition from post-secondary education

Self-reported skill level — Skill X	To a great extent	To some extent	Very little	Not at all
Excellent	1	2	4	4
Very good	1	2	4	4
Good	3	3	4	4
Not very good	4	4	4	4

"Skill Value-Added from Education" categories:

1. *Very high* (high skill, acquired from education)
2. *High* (high skill, from education to some extent)
3. *Moderate* (moderate skill, from education to some/great extent)
4. *Low* (all else)

Table 9 contrasts "skill value-added from education" across type/level of education and fields of study for critical thinking and problem solving skills. The higher the level of education, the greater the skill value-added. For critical thinking, only 25% of graduates from non-university

programs are in the "very high" category, along with 41% in the "high" category. A much higher proportion of respondents from university undergraduate programs are in the "very high" category (42%), while almost as many (40%) are in the "high" category. As for Ph.D. graduates, we find 62% in the "very high" and 30% in the "high" categories. Similar differences across type/level of education are observed for problem solving skills, although the proportions of university graduates in the "very high" category are not as large.

The pattern for writing skills (Table 10) is similar to that observed for cognitive skills (Table 9). The higher the level of education, the greater the "skill value-added" in this area. However, for skills in learning and using new technology, only graduates of doctoral programs stand out in the "very high" value-added category (38%, compared to about one in four graduates from other types of post-secondary institutions).

Turning to teamwork and leadership skills, we again observe a very different pattern (Table 11). With the exception of a slightly larger proportion of Ph.D. graduates in the "very high" skill value-added category for leadership skills (20%), there are few systematic differences in "skill value-added from education" across type/level of education for these two "social" skills. Most noteworthy about the findings in Table 11 is the substantial proportion of all graduates in the "low" skill value-added category (about one-third for teamwork skills and about 40% for leadership skills). Based on these self-reports, it is apparent that post-secondary institutions are much less likely to be developing strong "social" employment-related skills as compared to cognitive and communication skills.

Tables 9, 10, and 11 reveal some interesting field of study differences in "skill value-added" from post-secondary education, particularly among university undergraduates. For critical thinking, for example, arts graduates (fine arts, humanities, social sciences) are more likely than education graduates or graduates of health profession programs to be in the "very high" value-added category (Table 9). For problem solving, mathematics/physical science, engineering, and medicine/dentistry stand out as the groups with the highest proportion in the "very high" value-added category (Table 9). And for writing skills, humanities, social science, law, and education graduates are most likely to be in the "very high" category (Table 10). For each of these three

Table 9 **Skill Value-Added from Education: Critical Thinking and Problem Solving Skills by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Critical Thinking (%)				Problem Solving (%)			
	very high	*high*	*moderate*	*low*	*very high*	*high*	*moderate*	*low*
Trade/Vocational and Career/Technical	***25***	***41***	***17***	***17***	***25***	***42***	***15***	***19***
Business and commerce	21	40	20	19	19	41	18	21
Arts and humanities	26	40	16	18	23	39	17	21
Social science and services	27	44	15	14	30	44	12	14
Natural science and primary industries	25	41	16	18	22	42	15	21
Engineering and applied science	24	42	15	19	26	43	13	19
Health sciences and related	35	39	16	10	33	38	14	14
University Undergraduate	***42***	***40***	***11***	***8***	***29***	***45***	***12***	***14***
Commerce, management and administration	35	46	12	7	29	47	13	11
Fine and applied arts	47	32	8	13	28	44	12	17
Humanities	42	38	12	7	21	46	13	21
Social sciences	47	35	11	6	25	47	15	13
Law	49	40	3	8	37	40	12	12
Agriculture and biological sciences	44	34	14	7	35	46	12	7
Mathematics and physical sciences	49	35	8	7	46	37	10	7
Engineering and applied sciences	44	40	11	6	47	35	11	8
Medicine and dentistry	48	40	9	2	50	37	9	4
Other health professions	40	40	11	9	35	41	14	10
Education	37	44	9	10	24	48	10	19
University Masters-level	***47***	***39***	***7***	***6***	***32***	***47***	***9***	***12***
Commerce/management/administration	46	44	4	6	40	46	7	7
Fine arts/humanities/social sciences	52	35	7	7	27	49	9	15
Biological and physical sciences/engineering	49	36	8	6	41	41	12	6
Health professions	48	37	8	7	35	47	8	10
Education	37	47	10	6	24	52	8	16
University Doctoral-level	***62***	***30***	***4***	***4***	***47***	***39***	***6***	***8***
Commerce/arts	66	28	3	3	42	41	6	11
Science/health	60	31	5	4	53	37	5	5
Education	59	32	3	7	35	46	7	12

Table 10 **Skill Value-Added from Education: Writing Skills and Use of New Technology by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Writing (%)				Use of New Technology (%)			
	very high	*high*	*moderate*	*low*	*very high*	*high*	*moderate*	*low*
Trade/Vocational and Career/Technical	***27***	***33***	***19***	***21***	***27***	***37***	***13***	***23***
Business and commerce	28	35	19	17	30	35	13	22
Arts and humanities	25	35	18	21	29	36	12	23
Social science and services	29	38	17	16	20	37	13	31
Natural science and primary industries	21	32	24	23	27	38	13	22
Engineering and applied science	22	30	22	26	29	39	12	20
Health sciences and related	33	33	15	19	26	37	14	22
University Undergraduate	***43***	***33***	***12***	***12***	***21***	***35***	***10***	***33***
Commerce, management and administration	36	35	17	11	24	42	10	25
Fine and applied arts	35	35	8	23	9	29	18	44
Humanities	57	31	8	4	17	26	10	46
Social sciences	49	33	11	7	18	35	10	38
Law	48	29	7	16	13	27	11	50
Agriculture and biological sciences	40	34	13	13	29	39	9	23
Mathematics and physical sciences	31	28	19	22	37	38	9	17
Engineering and applied sciences	28	32	19	21	34	42	9	15
Medicine and dentistry	37	33	9	22	20	40	13	27
Other health professions	36	36	14	14	19	41	12	27
Education	45	35	10	11	20	32	10	38
University Masters-level	***45***	***36***	***9***	***11***	***25***	***32***	***10***	***33***
Commerce/management/administration	38	41	10	11	25	35	7	32
Fine arts/humanities/social sciences	49	36	6	9	21	29	10	40
Biological and physical sciences/engineering	40	31	15	14	40	38	9	13
Health professions	41	37	10	13	28	32	11	30
Education	50	33	5	11	20	27	10	43
University Doctoral-level	***55***	***29***	***8***	***8***	***38***	***31***	***9***	***22***
Commerce/arts	64	25	3	8	22	30	11	37
Science/health	50	32	11	7	51	31	8	10
Education	57	30	5	8	21	30	13	36

Table 11 **Skill Value-Added from Education: Teamwork and Leadership Skills by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Teamwork (%)				Leadership (%)			
	very high	*high*	*moderate*	*low*	*very high*	*high*	*moderate*	*low*
Trade/Vocational and Career/Technical	***24***	***37***	***6***	***32***	***14***	***29***	***16***	***42***
Business and commerce	24	37	6	33	14	28	16	43
Arts and humanities	29	34	7	30	14	34	13	39
Social science and services	30	40	5	25	21	33	15	31
Natural science and primary industries	20	38	7	35	15	28	14	42
Engineering and applied science	20	36	7	37	9	27	16	49
Health sciences and related	29	41	4	26	17	27	19	37
University Undergraduate	***22***	***40***	***6***	***31***	***14***	***32***	***13***	***41***
Commerce, management and administration	29	36	9	27	14	32	14	40
Fine and applied arts	32	34	10	24	15	30	17	39
Humanities	15	38	6	40	13	27	12	48
Social sciences	20	43	5	32	13	32	12	42
Law	13	33	4	50	7	25	10	58
Agriculture and biological sciences	21	43	4	32	15	25	14	47
Mathematics and physical sciences	19	39	9	33	9	27	14	50
Engineering and applied sciences	24	40	11	26	11	26	16	46
Medicine and dentistry	20	43	4	32	13	32	25	30
Other health professions	22	42	6	29	16	31	16	38
Education	25	42	4	28	20	40	9	31
University Masters-level	***19***	***42***	***7***	***32***	***13***	***33***	***12***	***42***
Commerce/management/administration	27	45	8	20	10	38	12	40
Fine arts/humanities/social sciences	16	41	6	37	13	29	13	45
Biological and physical sciences/engineering	18	39	9	34	11	24	16	49
Health professions	17	39	5	39	14	36	12	39
Education	19	44	6	31	18	39	9	34
University Doctoral-level	***20***	***41***	***7***	***33***	***20***	***33***	***11***	***36***
Commerce/arts	16	38	7	39	19	32	8	41
Science/health	22	43	8	27	20	33	14	33
Education	20	39	3	38	21	34	7	38

skill sets, commerce graduates are, at best, average with respect to proportions in the "very high" skill value-added category. Graduates of health profession programs are below average with respect to critical thinking and writing skills while, in general, "hard science" graduates are below average with respect to writing skills.

Field of study differences for skill value-added regarding use of new technologies are fairly predictable. Across all levels/types of education, engineering and "hard science" graduates are more likely to be in the "very high" value-added category (Table 10). As for the two social skills examined in this study (teamwork and leadership), field of study differences in skill value-added are not all that large (Table 11). Graduates of university undergraduate commerce programs are somewhat above average with respect to the proportion in the "very high" category for teamwork but, somewhat surprisingly, only average with respect to leadership skills.

What is most interesting, perhaps, is the extent to which different university programs contribute to the development of different employment-related skills. Some programs that might appear to be contributing relatively little, if evaluated in terms of "credential fit" or general self-reports of the extent to which jobs are related to completed post-secondary programs (see Part 3 above), reveal a considerably greater amount of "skill value-added" when a variety of different skill sets are examined, and when both skill level and skill acquisition (from post-secondary education) are measured.

5.4 Skill Use on the Job

For each of the six skill sets, the 1995 NGS also included a final question (for employed respondents only): *"To what extent do you use this ability in your current (main) job?"* Tables 12 and 13 examine the distributions of responses (for the categories "to a great extent" and "to some extent") across type/level of education and field of study.

For cognitive skills (critical thinking and problem solving) and writing skills, we see a familiar pattern – the higher the level of education, the greater the skill use on the job (Table 12). Leadership skill use and the ability to learn and use new technology on the job also vary in the same way (Table 13). The largest differences between graduates of non-university programs and the highest level of university graduates (i.e., Ph.D. graduates) are for writing skills used "to a

great extent" on the job (37% compared to 78%), followed by critical thinking skills (53% versus 82%). In contrast, while approximately 70% of all graduates reported that they used their teamwork skills on the job to a great extent, there was little variation across type/level of education.

Comparisons of on-the-job skill use across National Occupational Classification skill levels (Table 14) reveal that, for all six skill types, graduates in Skill Level A occupations (primarily managerial and professional occupations) were consistently more likely to indicate that they used their skills "to a great extent." Alternatively, those working in Skill Level D occupations (primarily unskilled jobs in the goods producing and service industries) were consistently less likely to indicate they used these different skills in their job. The differences between Skill Level A and Skill Level D are very large for on-the-job use of cognitive and communication skills, as well as for leadership and new technology skills. However, for teamwork, the difference is much smaller (75% in the "to a great extent" category for Skill Level A, compared to 64% for Skill Level D).

Further bivariate analyses reveal that graduates working full-time were more likely than part-time workers to use their thinking skills (60% versus 48%) and problem solving skills (60% versus 48%) on the job "to a great extent" (Table 14). While more than one-half of full-time workers (51%) specified that they used their "new technology" skills extensively in their job, only about one-third of part-time workers (35%) answered in this way. Table 14 also reveals that a higher percentage of self-employed workers versus paid workers reported using their thinking skills (68% versus 58%) and problem solving skills (64% versus 58%) extensively in their work. Perhaps surprisingly, we see very small differences in the self-reported use of these six different skill sets when comparing permanent and temporary employees. While temporary employees clearly face a less secure employment future, and probably receive lower incomes and fewer benefits, it appears that their jobs are not that much less skilled than those of permanent employees.

Table 12 **Self-reported Skill Use on the Job: Critical Thinking, Problem Solving and Writing Skills by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Critical Thinking (%)		Problem Solving (%)		Writing (%)	
	to great extent	*to some extent*	*to great extent*	*to some extent*	*to great extent*	*to some extent*
Trade/Vocational and Career/Technical	***53***	***35***	***55***	***36***	***37***	***34***
Business and commerce	48	39	51	39	39	33
Arts and humanities	48	38	50	38	32	35
Social science and services	56	32	63	29	47	32
Natural science and primary industries	53	35	51	37	27	36
Engineering and applied science	52	35	55	36	28	36
Health sciences and related	63	30	63	32	49	31
University Undergraduate	***62***	***29***	***60***	***33***	***51***	***30***
Commerce, management and administration	64	33	57	37	52	36
Fine and applied arts	60	25	60	31	37	28
Humanities	49	37	46	44	45	31
Social sciences	56	31	54	37	47	29
Law	84	12	71	19	73	21
Agriculture and biological sciences	54	31	54	35	38	32
Mathematics and physical sciences	70	25	71	25	42	39
Engineering and applied sciences	70	24	68	28	47	37
Medicine and dentistry	85	13	85	13	56	33
Other health professions	76	20	71	27	54	34
Education	63	29	64	31	63	22
University Masters-level	***73***	***22***	***70***	***26***	***67***	***25***
Commerce/management/administration	81	17	75	24	70	24
Fine arts/humanities/social sciences	68	24	64	30	65	23
Biological and physical sciences/engineering	75	22	70	26	62	29
Health professions	78	19	76	22	69	25
Education	70	27	72	25	68	24
University Doctoral-level	***82***	***16***	***75***	***23***	***78***	***18***
Commerce/arts	85	13	71	26	84	13
Science/health	81	18	77	22	74	22
Education	82	16	76	21	81	14

Note: For each skill, four response categories were presented to graduates including "to a great extent," "to some extent," "very little," and "not at all." Only findings from the first two response categories are displayed here.

Table 13 **Self-reported Skill Use on the Job: Teamwork, Leadership Skills and Use of New Technology by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Teamwork (%)		Leadership (%)		Use of New Technology (%)	
	to great extent	*to some extent*	*to great extent*	*to some extent*	*to great extent*	*to some extent*
Trade/Vocational and Career/Technical	***71***	***24***	***33***	***37***	***47***	***38***
Business and commerce	71	24	32	36	49	37
Arts and humanities	69	27	31	37	48	37
Social science and services	79	18	43	33	40	41
Natural science and primary industries	65	28	34	38	44	41
Engineering and applied science	64	29	26	39	49	38
Health sciences and related	79	18	38	38	49	39
University Undergraduate	***73***	***22***	***44***	***34***	***49***	***38***
Commerce, management and administration	67	28	41	38	57	35
Fine and applied arts	74	19	51	24	43	40
Humanities	72	22	42	36	45	37
Social sciences	75	21	40	32	47	39
Law	67	27	20	37	37	44
Agriculture and biological sciences	75	21	41	34	45	39
Mathematics and physical sciences	65	28	30	42	64	29
Engineering and applied sciences	70	25	33	40	56	37
Medicine and dentistry	82	18	50	39	53	39
Other health professions	81	17	43	39	49	42
Education	77	20	59	27	45	41
University Masters-level	***73***	***23***	***43***	***36***	***53***	***38***
Commerce/management/administration	72	24	42	40	59	36
Fine arts/humanities/social sciences	70	23	39	35	46	40
Biological and physical sciences/engineering	66	31	33	43	61	33
Health professions	78	21	43	40	49	41
Education	83	14	60	29	52	39
University Doctoral-level	***68***	***27***	***49***	***35***	***61***	***34***
Commerce/arts	68	25	51	32	48	43
Science/health	66	30	46	38	70	27
Education	78	18	59	33	56	38

Note: For each skill, four response categories were presented to graduates including "to a great extent," "to some extent," "very little," and "not at all." Only findings from the first two response categories are displayed here.

Table 14 **Self-reported Skill Use on the Job by Employment Characteristics, 1995 NGS**

	Critical thinking (%) *to a great extent*	**Problem Solving (%)** *to a great extent*	**Writing (%)** *to a great extent*	**Teamwork (%)** *to a great extent*	**Leadership (%)** *to a great extent*	**Use of New Technology (%)** *to a great extent*
*NOC Skill Levels**						
Level A	72	70	61	75	48	54
Level B	59	59	41	71	33	52
Level C	42	45	29	70	31	41
Level D	28	30	17	64	24	26
Part-time	48	48	42	70	35	35
Full-time	60	60	46	72	39	51
Paid workers	58	58	46	73	38	49
Self-employed	68	64	46	62	42	51
Permanent	59	59	46	73	39	50
Temporary	58	56	45	68	38	45

* Source: National Occupational Classification, Minister of Supply and Services Canada, 1993.

The small differences between permanent and temporary employees (Table 14) highlight a pattern that was not seen as clearly in the previous tables that emphasized level of education, field of study, and occupation differences. Specifically, when *comparing across the six skill sets*, we see about 70% of all post-secondary graduates reporting extensive use of teamwork skills in their current job. Less than 40% indicate that they made use of their leadership skills that frequently. Close to 60% of all graduates appear to use their critical thinking and problem solving skills frequently in their work, while somewhat less than half report extensive use of their new technology and writing skills. These findings reveal fairly wide-spread under-utilization of employment skills among recent post-secondary graduates in Canada.[19]

5.5 "Skill Value-Added" Used on the Job

The final step in our analysis involves linking the derived variable measuring "skill value-added from post-secondary education" (Section 5.3 above) with responses to the questions about skill use on the job (Section 5.4 above). Box 3 demonstrates how four *"skill value-added used on the job"* categories were constructed from these two measures, for each of the six skill sets. Employed graduates in the "very high" skill value-added from education category who also used their skills "to a great extent" were placed in the "*very high*" category. Those in the "very high" skill value-added from education category who used their skills "to some extent" were put in the "*high*" category, along with those in the "high" value-added group who used their skills "to a great extent. In contrast, graduates reporting "low" skill value-added from education, along with all those reporting very low skill use on the job, were placed in the "*low*" skill value-added used on the job category. The remainder of the employed graduates comprise the *"moderate"* category.

[19] See Krahn and Lowe (1998b) for a similar argument about under-utilization of literacy skills in the Canadian labour market, and Kelly et al. (1997) on under-employment among Canadian workers.

Table 15 clearly demonstrates that the higher the level of post-secondary education, the greater the "skill value-added used on the job" for both types of cognitive skills (critical thinking and problem solving). For example, 19% of trade/vocational and career/technical graduates are in the "very high" category for critical thinking skills, compared to 30% of the graduates of university undergraduate programs, 38% of masters level graduates, and 55% of Ph.D. graduates. For problem solving skills, the proportions in the "very high" value-added used on the job category range from 20% to 42%. Graduates from health-related programs, with professional degrees (e.g., medicine, dentistry, law), and those with "hard science" or engineering degrees tend to be over-represented in the "very high" category.

Box 3

Construction of "Skill Value-Added Used on the Job" Variables, 1995 NGS

Skill use on the job

Skill value-added from education (see Box 2)	Skill X: To a great extent	To some extent	Very little	Not at all
Very high	1	2	4	4
High	2	3	4	4
Moderate	3	3	4	4
Low	4	4	4	4

"Skill Value-Added Used on the Job" categories:

1. *Very high* (high skill. from education. used extensively)
2. *High* (high skill. from education to some extent. used extensively OR high skill. from education. used to some extent)
3. *Moderate* (moderate skill. from education to some/great extent. used to some/great extent)
4. *Low* (all else)

For writing skills (Table 16), we see a similar pattern. The higher the level of education, the greater the "skill value-added used on the job." Generally, graduates of Arts programs in the university system (e.g., humanities, social sciences), along with law graduates and education graduates, are over-represented in the "very high" category for writing skills. As for use of new technologies, the lowest level of "skill value-added used on the job" is observed among

university undergraduates (16%). A slightly higher proportion of graduates from non-university programs and from masters level programs (20%) are in the "very high" category, along with 32% of the Ph.D. graduates. Comparing across fields of study within the university system, engineering and "hard science" graduates are more likely to be in jobs where they make extensive use of the high level of new technology skills they acquired from their education.

For teamwork and leadership skills, we again see a different picture (Table 17). The proportions in the "very high" value-added used on the job category are generally smaller, and we do not see an increase in this category as we move from non-university programs into the higher-level university programs. Commerce/management/administration graduates are no more likely than graduates from other programs to be in the "very high" category for leadership skills. Instead, education graduates stand out in this respect.

Table 18 displays differences across the four NOC occupational skill levels in "skill value-added used on the job." As we would expect (from an occupational classification based on skill differences), graduates in Skill Level A occupations were most likely to be in the "very high" category for all six skill types, while those in Skill Level D occupations were much less likely to be in the "very high" category. The percentage differences between those in Skill Level A and Skill Level D occupations were largest for critical thinking skills (35% versus 11%), problem solving skills (28% versus 11%), writing skills (29% versus 6%), and use of new technology (20% and 9%).

Additional findings for "skill value-added used on the job" for all six skill types reveal that there were not large differences between those in part-time versus full-time jobs, between paid workers versus the self-employed, and between permanent and temporary employees (Table 18). For example, the largest differences were found between graduates in full-time and in part-time jobs for critical thinking skills (27% versus 21% in the "very high" category) and for use of new technology (19% versus 13% "very high").

Table 15 **Skill Value-Added Used on the Job: Critical Thinking and Problem Solving Skills by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Critical Thinking (%)				Problem Solving (%)			
	very high	*high*	*moderate*	*low*	*very high*	*high*	*moderate*	*low*
Trade/Vocational and Career/Technical	***19***	***25***	***31***	***24***	***20***	***25***	***30***	***24***
Business and commerce	16	23	34	27	15	23	34	28
Arts and humanities	19	23	32	26	19	21	32	27
Social science and services	20	28	30	22	25	31	26	19
Natural science and primary industries	19	26	29	26	17	25	32	27
Engineering and applied science	18	24	31	27	20	26	30	24
Health sciences and related	30	26	29	15	29	24	30	18
University Undergraduate	***30***	***31***	***23***	***15***	***22***	***31***	***28***	***18***
Commerce, management and administration	27	35	29	10	21	32	30	17
Fine and applied arts	33	22	20	25	21	31	22	26
Humanities	22	31	27	19	14	25	36	25
Social sciences	30	30	22	17	17	32	31	20
Law	49	33	8	9	30	33	21	17
Agriculture and biological sciences	26	33	20	21	24	32	28	16
Mathematics and physical sciences	39	30	19	11	34	35	20	10
Engineering and applied sciences	34	32	22	12	37	30	22	11
Medicine and dentistry	47	29	21	3	51	29	16	5
Other health professions	37	31	22	11	32	29	28	11
Education	29	32	22	16	19	34	26	21
University Masters-level	***38***	***35***	***17***	***10***	***27***	***35***	***23***	***14***
Commerce/management/administration	41	37	13	8	35	36	20	9
Fine arts/humanities/social sciences	38	33	16	12	21	34	25	19
Biological and physical sciences/engineering	43	29	19	9	34	32	24	9
Health professions	41	32	18	9	33	36	20	11
Education	28	41	22	9	21	38	23	18
University Doctoral-level	***55***	***28***	***12***	***5***	***42***	***31***	***19***	***9***
Commerce/arts	59	27	9	5	37	31	20	12
Science/health	54	27	14	5	47	30	18	5
Education	48	35	8	9	31	35	21	14

Table 16 **Skill Value-Added Used on the Job: Writing Skills and Use of New Technology by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Writing (%)				Use of New Technology (%)			
	very high	*high*	*moderate*	*low*	*very high*	*high*	*moderate*	*low*
Trade/Vocational and Career/Technical	***15***	***19***	***27***	***39***	***20***	***22***	***29***	***29***
Business and commerce	17	21	27	36	22	21	28	29
Arts and humanities	13	16	30	41	22	21	25	32
Social science and services	18	24	26	33	14	19	31	37
Natural science and primary industries	9	17	30	44	19	22	30	28
Engineering and applied science	9	16	27	48	21	24	29	27
Health sciences and related	22	20	24	33	20	23	30	27
University Undergraduate	***25***	***28***	***20***	***26***	***16***	***23***	***25***	***36***
Commerce, management and administration	23	27	29	21	17	30	25	28
Fine and applied arts	18	22	13	46	7	21	25	47
Humanities	26	31	17	26	11	20	20	50
Social sciences	26	28	18	27	13	21	25	41
Law	41	30	11	19	8	12	26	54
Agriculture and biological sciences	16	26	19	40	20	20	26	34
Mathematics and physical sciences	17	21	29	33	30	28	21	21
Engineering and applied sciences	17	24	25	34	26	27	28	19
Medicine and dentistry	24	35	14	28	21	21	31	26
Other health professions	22	30	27	20	15	25	30	30
Education	32	29	16	22	16	19	26	39
University Masters-level	***32***	***32***	***18***	***18***	***20***	***22***	***23***	***35***
Commerce/management/administration	28	37	20	15	21	24	22	33
Fine arts/humanities/social sciences	33	33	15	19	14	19	24	43
Biological and physical sciences/engineering	29	26	25	20	30	30	23	17
Health professions	31	33	19	18	21	20	27	32
Education	38	29	15	18	16	17	23	44
University Doctoral-level	***48***	***27***	***15***	***10***	***32***	***23***	***23***	***22***
Commerce/arts	56	27	7	10	18	18	27	37
Science/health	43	26	21	10	43	25	21	11
Education	51	27	12	11	16	26	24	34

Table 17 **Skill Value-Added Used on the Job: Teamwork and Leadership Skills by Education Level/Field of Study, 1995 NGS**

Education Level/Field of Study	Teamwork (%)				Leadership (%)			
	very high	*high*	*moderate*	*low*	*very high*	*high*	*moderate*	*low*
Trade/Vocational and Career/Technical	***22***	***27***	***18***	***34***	***10***	***14***	***25***	***51***
Business and commerce	21	26	18	35	9	13	25	53
Arts and humanities	27	23	19	31	10	13	26	51
Social science and services	27	31	14	28	17	18	24	41
Natural science and primary industries	18	24	20	37	10	13	25	52
Engineering and applied science	16	24	20	40	5	11	25	59
Health sciences and related	25	33	13	29	13	15	27	45
University Undergraduate	***20***	***30***	***16***	***34***	***10***	***18***	***22***	***50***
Commerce, management and administration	22	27	20	32	10	16	25	48
Fine and applied arts	29	31	11	28	12	20	17	51
Humanities	14	29	16	41	9	16	20	55
Social sciences	18	34	14	34	8	18	21	53
Law	11	17	16	56	1	10	20	69
Agriculture and biological sciences	18	33	14	36	9	19	16	56
Mathematics and physical sciences	18	28	19	35	6	11	26	57
Engineering and applied sciences	21	29	21	29	7	12	24	57
Medicine and dentistry	19	32	16	34	14	19	30	37
Other health professions	22	33	15	30	12	15	29	44
Education	23	31	16	30	16	27	18	39
University Masters-level	***16***	***34***	***16***	***34***	***10***	***19***	***22***	***49***
Commerce/management/administration	23	37	19	21	9	18	25	48
Fine arts/humanities/social sciences	13	32	15	40	9	17	20	54
Biological and physical sciences/engineering	14	29	21	36	7	13	23	57
Health professions	16	31	13	39	11	17	28	44
Education	17	39	13	31	16	27	20	37
University Doctoral-level	***17***	***29***	***20***	***34***	***15***	***19***	***23***	***43***
Commerce/arts	15	28	16	41	15	21	18	46
Science/health	19	29	23	28	14	17	28	41
Education	18	33	10	39	17	27	16	41

Table 18 **Skill Value-Added Used On the Job by Employment Characteristics, 1995 NGS**

	Critical Thinking (%)		Problem Solving (%)		Writing (%)		Teamwork (%)		Leadership (%)		Use of New Technology (%)	
	very high	*high*	*very high*	*high*	*very high*	*high*	*very high*	*high*	*very high*	*high*	*very high*	*high*
*NOC Skill Levels**												
Level A	35	33	28	34	29	29	21	32	12	20	20	25
Level B	23	29	21	28	17	23	21	26	8	14	20	23
Level C	17	23	16	24	13	19	21	27	10	12	17	18
Level D	11	17	11	16	6	11	17	26	6	12	9	16
Part-time	21	25	19	23	20	22	21	28	11	15	13	18
Full-time	27	29	22	30	21	24	20	29	10	16	19	23
Paid workers	26	28	22	28	21	24	21	29	10	16	18	22
Self-employed	26	30	23	30	21	24	18	24	10	14	17	21
Permanent	26	28	22	29	21	24	21	29	10	16	19	23
Temporary	25	29	21	28	21	25	20	27	11	16	17	21

* Source: *National Occupational Classification*, Minister of Supply and Services Canada, 1993

The very small differences between permanent and temporary workers observed in Table 18 again allow a clear comparison *across the six skill sets* in terms of how much value-added Canadian post-secondary education institutions appear to be contributing in the workplace. About one in four of all graduates (26%) are in the "very high" category for critical thinking skills, while about one in five are in this category for problem solving (22%), writing (21%), teamwork (20%), and use of new technology skills (about 18%). But only 10% of all post-secondary graduates are in the "very high" category for leadership skills.

As in previous sections of this report, there is merit in moving from bivariate analyses to multivariate analyses that can examine the net effects of program of study on "skill value-added used on the job," controlling on respondent and labour market characteristics. Tables 19 and 20 present stepwise multivariate logistic regression analyses for the six different skill sets for 1995 graduates of trade/vocational and career/technical programs. Tables 21 and 22 present equivalent analyses for graduates of university undergraduate programs. For each skill set, the binary dependent variables are coded as '1' for graduates in the "very high" skill value-added used on the job category, and '0' for all others. The first equation in each analysis contains only fields of study as independent variables (with health science/health profession graduates as the reference category), while the second equation adds respondent and labour market characteristics to the list of predictors.

Beginning with trade/vocational and career/technical graduates, we observe that, compared to health science graduates, graduates of all other programs are significantly less likely to be in the "very high" skill value-added used on the job category for critical thinking, problem solving, and writing skills (Table 19). However, arts/humanities and social science/services graduates are little different from health science graduates with respect to teamwork skills, and social science graduates are significantly more likely to be in the "very high" category for leadership skills (Table 20). For use of new technology, only social science graduates stand out from health science graduates, with the former significantly less likely to be in the "very high" category (Table 20).

Table 19 **Logistic Regression Results: Skill Value-Added Used on the Job, Critical Thinking, Problem Solving, and Writing Skills Regressed on Field of Study, Respondent Characteristics, and Labour Market Characteristics; Trade/Vocational and Career/Technical Graduates, 1995 NGS**

Independent Variables	ODDS-RATIOS#					
	Critical Thinking		Problem Solving		Writing	
	Equation 1	*Equation 2*	*Equation 1*	*Equation 2*	*Equation 1*	*Equation 2*
Field of Study *						
Business and commerce	0.435	0.544	0.441	0.520	0.695	0.939 ~
Arts and humanities	0.562	0.691	0.591	0.721	0.540	0.748
Social science and services	0.606	0.659	0.805	0.864 ~	0.772	0.889 ~
Natural science and primary industries	0.543	0.664	0.494	0.607	0.336	0.527
Engineering and applied science	0.522	0.608	0.608	0.733	0.348	0.526
Respondent Characteristics *						
Gender (male = 1)	--	0.805	--	0.923 ~	--	0.980 ~
Age 25 to 29	--	0.991 ~	--	1.037 ~	--	1.079 ~
Age 30 and older	--	0.863	--	0.825	--	1.130 ~
Prior full-time work experience	--	0.994 ~	--	0.967 ~	--	1.035 ~
Coop program graduate	--	- @	--	- @	--	- @
Labour Market Characteristics *						
Professional/managerial occupations	--	1.941	--	1.517	--	2.468
Clerical/sales/service occupations	--	1.143 ~	--	1.114 ~	--	1.503
Goods-producing industries	--	1.091 ~	--	1.031 ~	--	1.474
Upper tier service industries	--	1.177 ~	--	1.140 ~	--	1.789
Part-time employment	--	0.824	--	0.930 ~	--	0.804
Permanent employment	--	1.013 ~	--	1.123 ~	--	0.905 ~
Concordance Rate	44.9%	59.4%	44.9%	58.5%	47.9%	62.9%

\# Odds-ratios compare (all other things being equal) specific characteristics or categories with a designated reference category (given a value of 1.0). For example, an odds ratio of 0.5 means that the odds of the characteristic or category under consideration are only half as high as the odds for the reference category.

* For each of the six skills, the binary dependent variable is defined as "1" equalling "very high" skill value-added used on the job. All independent variables were coded into binary (1, 0) variables. "Health sciences and related" was omitted as field of study reference category, "blue collar occupations" omitted as occupation reference category, "lower tier services" omitted as industry reference category, and "age 17 to 24" omitted as age reference category.

~ Not statistically significant ($p > .01$).

@ Coop program not included in regression analyses because of missing data for over one-third of the cases. The regression analyses were rerun with coop program included (and a smaller sample), but no important differences in the pattern of results were observed.

Table 20 **Logistic Regression Results: Skill Value-Added Used on the Job, Teamwork, Leadership Skills, and Use of New Technology Regressed on Field of Study, Respondent Characteristics, and Labour Market Characteristics; Trade/Vocational and Career/Technical Graduates, 1995 NGS**

Independent Variables	ODDS-RATIOS#					
	Teamwork		Leadership		Use of New Technology	
	Equation 1	*Equation 2*	*Equation 1*	*Equation 2*	*Equation 1*	*Equation 2*
Field of Study *						
Business and commerce	0.803	0.929 ~	0.696	0.749	1.139 ~	1.359
Arts and humanities	1.095 ~	1.146 ~	0.800 ~	0.763 ~	1.115 ~	1.336
Social science and services	1.095 ~	1.092 ~	1.377	1.430	0.627	0.673
Natural science and primary industries	0.639	0.758 ~	0.744 ~	0.855 ~	0.960 ~	1.259 ~
Engineering and applied science	0.578	0.707	0.375	0.420	1.039 ~	1.391
Respondent Characteristics *						
Gender (male = 1)	--	1.106 ~	--	0.892 ~	--	1.129 ~
Age 25 to 29	--	0.722	--	0.860 ~	--	0.849
Age 30 and older	--	0.569	--	0.712	--	0.892 ~
Prior full-time work experience	--	0.847	--	0.974 ~	--	0.964 ~
Coop program graduate	--	- @	--	- @	--	- @
Labour Market Characteristics *						
Professional/managerial occupations	--	1.372	--	1.762	--	1.768
Clerical/sales/service occupations	--	1.085 ~	--	1.178 ~	--	1.350
Goods-producing industries	--	0.917 ~	--	0.648	--	1.297
Upper tier service industries	--	0.971 ~	--	0.697	--	1.320
Part-time employment	--	0.951 ~	--	0.777	--	0.753
Permanent employment	--	0.932 ~	--	0.928 ~	--	0.913 ~
Concordance Rate	44.3%	60.3%	51.3%	63.2%	40.0%	57.8%

\# Odds-ratios compare (all other things being equal) specific characteristics or categories with a designated reference category (given a value of 1.0). For example, an odds ratio of 0.5 means that the odds of the characteristic or category under consideration are only half as high as the odds for the reference category.

* For each of the six skills, the binary dependent variable is defined as "1" equalling "very high" skill value-added used on the job. All independent variables were coded into binary (1, 0) variables. "Health sciences and related" was omitted as field of study reference category, "blue collar occupations" omitted as occupation reference category, "lower tier services" omitted as industry reference category, and "age 17 to 24" omitted as age reference category.

~ Not statistically significant ($p > .01$).

@ Coop program not included in regression analyses because of missing data for over one-third of the cases. The regression analyses were rerun with coop program included (and a smaller sample), but no important differences in the pattern of results were observed.

When respondent and labour market characteristics are added to these logistic regression analyses (equations 2 in Tables 19 and 20), the field of study differences decline somewhat, although the relative rankings of the different programs do not change. Instead, we see a few small age and gender differences that are statistically significant. Controlling on the other variables in the equations, prior full-time work experience has minimal impact on skill value-added used on the job. However, we observe a consistent pattern across all six skill sets for occupational effects. Compared to graduates in blue collar occupations, those in professional/managerial occupations are significantly more likely to be in the "very high" skill value-added used on the job category, controlling on field of study and respondent characteristics. Similarly, graduates in clerical/sales/service occupations are more likely to be in this category for writing and use of new technology skills. Part-time workers are significantly less likely than those in full-time jobs to be in the "very high" category for critical thinking, leadership, writing, and use of new technology skills. In general, across all six skill sets, it is apparent that labour market differences explain as much, if not more, variation in skill use on the job as do post-secondary program differences.

Turning to the university undergraduate sub-sample, we observe that commerce, humanities, social science, biological science, and education graduates are significantly less likely than graduates of health science professional programs to be in the "very high" skill value-added used on the job category for critical thinking skills (Table 21). In turn, law graduates are significantly more likely to be in this category. A similar pattern is observed for problem solving skills, but with fine arts graduates joining the group under-represented in the "very high" category and with medicine/dentistry replacing law as the group significantly more likely to be in this category. When respondent and labour market characteristics are added to the analysis (equation 2), the field of study differences decline somewhat, but the pattern does not really change. What we do observe is that, controlling on field of study and respondent characteristics, graduates in professional/managerial jobs are significantly more likely to be in the "very high" category while those in part-time jobs are less likely.

Our multivariate analysis of the extent to which writing skills acquired in university are used on the job reveals another pattern. Initially, law and education graduates are significantly more

likely to be in the "very high" category (Table 21, equation 1), but after controlling on respondent and labour market characteristics, humanities and social science, graduates also join this group. Thus, the writing skills developed in university education, liberal arts, and law programs do appear to be used on the job by graduates to a considerable extent. And, controlling on these field of study differences, graduates in professional/managerial and clerical/sales/service jobs (compared to blue collar jobs), and those in the goods-producing and upper tier service industries (compared to the lower tier services), are more likely to be making extensive use of their university-acquired writing skills in their jobs.

Table 22 profiles the determinants of employment-related social skills in the same manner. Compared to health science graduates, law and humanities graduates are less likely to be in the "very high" skill value-added used on the job category for teamwork. Social science, law, mathematics/physical sciences, and engineering graduates are less likely to be in this category for leadership skills. After adding respondent and labour market characteristics to the analysis (equation 2), fine arts graduates join the group in the "very high" category for teamwork, while the social science versus health professional difference for leadership is no longer statistically significant. Unlike the pattern observed for thinking skills, we observe no important labour market differences. Whatever the type of job graduates find themselves in (i.e., comparing industry, occupation, and employment status characteristics), the extent to which teamwork and leadership skills acquired in post-secondary education are used on the job does not vary to a significant extent.

Finally, the logistic regression analyses indicate that "hard science" graduates are more likely to be using their university-acquired technology skills in their jobs (compared to health profession graduates), even after controlling on respondent and labour market characteristics (Table 22). Male graduates are also significantly more likely to be in the "very high" category, as are graduates in professional/managerial jobs. In contrast, graduates in part-time jobs were significantly less likely to be using these technology skills on the job.

Table 21 **Logistic Regression Results: Skill Value-Added Used on the Job, Critical Thinking, Problem Solving and Writing Skills Regressed on Field of Study, Respondent Characteristics, and Labour Market Characteristics; University Undergraduates, 1995 NGS**

Independent Variables	ODDS-RATIOS#					
	Critical Thinking		Problem Solving		Writing	
	Equation 1	*Equation 2*	*Equation 1*	*Equation 2*	*Equation 1*	*Equation 2*
Field of Study *						
Commerce, management and administration	0.627	0.696	0.574	0.657	1.059 ~	1.318 ~
Fine and applied arts	0.844 ~	1.008 ~	0.580	0.682 ~	0.765 ~	0.997 ~
Humanities	0.503	0.619	0.356	0.475	1.214 ~	1.889
Social sciences	0.753	0.900 ~	0.431	0.517	1.238 ~	1.811
Law	1.695	1.882	0.901 ~	1.113 ~	2.373	3.460
Agriculture and biological sciences	0.610	0.795 ~	0.666	0.903 ~	0.634	0.931 ~
Mathematics and physical sciences	1.115 ~	1.106 ~	1.118 ~	1.148 ~	0.714 ~	0.767 ~
Engineering and applied sciences	0.890 ~	0.966 ~	1.248 ~	1.446 ~	0.711 ~	0.820 ~
Medicine and dentistry	1.569 ~	1.489 ~	2.221	2.163	1.066 ~	1.148 ~
Education	0.715	0.754 ~	0.508	0.536	1.653	1.934
Respondent Characteristics *						
Gender (male = 1)	--	1.079 ~	--	1.035 ~	--	1.124 ~
Age 25 to 29	--	0.841 ~	--	0.922 ~	--	1.316
Age 30 and older	--	0.657	--	0.724	--	1.320
Prior full-time work experience	--	0.966 ~	--	1.039 ~	--	1.026 ~
Coop program graduate	--	1.084 ~	--	0.982 ~	--	1.224 ~
Labour Market Characteristics *						
Professional/managerial occupations	--	2.233	--	2.121	--	3.741
Clerical/sales/service occupations	--	1.089 ~	--	0.970 ~	--	1.758
Goods-producing industries	--	0.941 ~	--	0.928 ~	--	1.700
Upper tier service industries	--	1.173 ~	--	1.195 ~	--	1.690
Part-time employment	--	0.601	--	0.747	--	0.845 ~
Permanent employment	--	1.156 ~	--	1.066 ~	--	1.151 ~
Concordance Rate	50.5%	61.3%	55.1%	63.5%	51.1%	63.7%

\# Odds-ratios compare (all other things being equal) specific characteristics or categories with a designated reference category (given a value of 1.0). For example, an odds ratio of 0.5 means that the odds of the characteristic or category under consideration are only half as high as the odds for the reference category.

* See Table 19 for an explanation of reference categories used in this analysis. For university undergraduates, "Other health professions" was omitted as the reference category for field of study.

~ Not statistically significant ($p > .01$).

Table 22 **Logistic Regression Results: Skill Value-Added Used on the Job, Teamwork, Leadership Skills, and Use of New Technology Regressed on Field of Study, Respondent Characteristics, and Labour Market Characteristics; University Undergraduates, 1995 NGS**

Independent Variables	ODDS-RATIOS#					
	Teamwork		Leadership		Use of New Technology	
	Equation 1	*Equation 2*	*Equation 1*	*Equation 2*	*Equation 1*	*Equation 2*
***Field of Study** *						
Commerce, management and administration	0.978 ~	0.923 ~	0.806 ~	0.958 ~	1.166 ~	1.244 ~
Fine and applied arts	1.450 ~	1.649	0.989 ~	1.156 ~	0.440	0.536 ~
Humanities	0.560	0.595	0.702 ~	0.823 ~	0.694 ~	0.904 ~
Social sciences	0.744 ~	0.780 ~	0.642	0.717 ~	0.840 ~	0.976 ~
Law	0.429	0.473	0.078	0.104	0.533 ~	0.643 ~
Agriculture and biological sciences	0.757 ~	0.729 ~	0.732 ~	0.868 ~	1.425 ~	1.752
Mathematics and physical sciences	0.762 ~	0.678 ~	0.437	0.464	2.523	2.764
Engineering and applied sciences	0.907 ~	0.793 ~	0.502	0.628 ~	2.038	2.468
Medicine and dentistry	0.793 ~	0.684 ~	1.150 ~	1.380 ~	1.512 ~	1.620 ~
Education	1.046 ~	1.129 ~	1.349 ~	1.560	1.088 ~	1.215 ~
***Respondent Characteristics** *						
Gender (male = 1)	--	1.032 ~	--	1.290	--	1.319
Age 25 to 29	--	1.088 ~	--	1.023 ~	--	1.026 ~
Age 30 and older	--	0.806 ~	--	0.994 ~	--	1.093 ~
Prior full-time work experience	--	0.701	--	0.863 ~	--	0.831 ~
Coop program graduate	--	1.267 ~	--	1.206 ~	--	1.226 ~
***Labour Market Characteristics** *						
Professional/managerial occupations	--	0.958 ~	--	0.851 ~	--	1.660
Clerical/sales/service occupations	--	0.875 ~	--	0.693 ~	--	1.272 ~
Goods-producing industries	--	1.026 ~	--	0.947 ~	--	1.274 ~
Upper tier service industries	--	1.098 ~	--	1.005 ~	--	1.449 ~
Part-time employment	--	0.883 ~	--	1.240 ~	--	0.701
Permanent employment	--	1.121 ~	--	1.075 ~	--	1.105 ~
Concordance Rate	49.9%	57.9%	55.7%	61.4%	55.8%	62.3%

\# Odds-ratios compare (all other things being equal) specific characteristics or categories with a designated reference category (given a value of 1.0). For example, an odds ratio of 0.5 means that the odds of the characteristic or category under consideration are only half as high as the odds for the reference category.

* See Table 19 for an explanation of reference categories used in this analysis. For university undergraduates, "Other health professions" was omitted as the reference category for field of study.

~ Not statistically significant ($p > .01$).

6. Summary and Conclusions

6.1 Summary

Looking back over the analyses discussed in Parts 4 and 5 above, it is apparent that individuals who obtained university *graduate* degrees are typically in a better education-job fit situation than are university undergraduates and graduates of non-university post-secondary programs, no matter how education-job fit is measured. Given this consistent pattern, the following summary will not comment on findings for recipients of master's and doctoral degrees. Instead, it will focus on the two post-secondary sectors that accounted for 90% of all graduates in both 1990 and 1995, namely, trade/vocational and career/technical programs, and university undergraduate programs.

The 1990 NGS revealed that about six out of ten university (under)graduates and a similar proportion of trade/vocational and career/technical graduates were in a *credential fit* type of job (i.e., a job for which their program had been explicitly designed or one where the employer had specified that their particular post-secondary credential was a requirement). When asked about the skills and knowledge acquired in their post-secondary programs, about half of the non-university graduates and about 40% of university (under)graduates reported that such skills and knowledge were used "to a great extent" in their job. Combining these two indicators of education-job fit, we observed that about 40% of the non-university graduates were in jobs *closely related* to their field of study, compared to about one-third of university (under)graduates.

Within both groups of post-secondary graduates, a very large majority of those with health science credentials were in a "credential fit" employment situation, as were engineering graduates in the university (under)graduate group. Similarly, a large majority of graduates of non-university health science programs and university (under)graduates from professional programs (e.g., law, medicine/dentistry, other health science) were in jobs "closely related" to their field of study. In contrast, less than one-quarter of university fine arts, humanities and social science graduates were in this category.

When the effects of respondent and labour market characteristics were examined in multi-variate analyses of education-job fit (for both the "credential fit" and "job related to field of study"

dependent variables), the differences between graduates of professional programs (e.g., other health sciences) and other types of graduates were reduced. In some cases, the relative ranking of fields of study shifted. These changes suggest that at least some of the field of study differences in employment outcomes are a function of other factors. The multi-variate analyses also demonstrated that labour market characteristics have a more prominent effect on education-job fit than do respondent characteristics. Specifically, individuals in professional/managerial occupations, those employed in the upper tier service industries (e.g., business services, education and health services), and graduates in permanent jobs are much more likely to be in an education-job fit situation.

The 1995 NGS showed that graduates of trade/vocational and career/technical programs and university (under)graduates were fairly similar in how they rated a number of their employment-related skills. About 50% evaluated their teamwork skills as "excellent," around 40% were as positive about their new technology skills, approximately 30% evaluated their problem solving skills as "excellent," and about one in four responded in this manner with respect to their leadership skills. However, university (under)graduates were more positive about their critical thinking and writing skills – about 40% rated them as "excellent," compared to about 30% of the non-university graduates.

University (under)graduates were considerably more likely than non-university graduates to report that their critical thinking and writing skills had improved "to a great extent" as a result of their education. For the other four employment-related skills, the differences between the two groups of graduates were not particularly noteworthy. Thus, combining the information on skill level and skill acquisition, we find a considerably higher proportion of university (under)graduates in the "very high" skill value-added category for critical thinking and writing skills. University (under)graduates are also somewhat more likely to be in the "very high" category for problem-solving skills. The two groups do not differ with respect to skill value-added for teamwork and leadership skills, while non-university graduates were somewhat more likely to be in the "very high" category for use of new technology skills.

Some field of study differences in "skill value-added from post-secondary education" are fairly predictable. For example, for problem solving skills, mathematics/physical science, engineering,

and medicine/dentistry university (under)graduates stand out. Similarly, engineering and mathematics/physical science graduates are more likely to be in the "very high" value-added category for use of new technology. However, some university programs that appeared to be contributing relatively little when evaluated in terms of "credential fit" or the extent to which graduates' jobs were directly related to their fields of study (the 1990 NGS analyses), reveal a much greater amount of "skill value-added" in this analysis of the 1995 NGS data. Specifically, in the university (under)graduate sample, arts graduates (fine arts, humanities, and social sciences) stand out with respect to skill value-added for critical thinking and for writing skills, along with law graduates, many of whom would have entered law school with an arts degree. In contrast, graduates of health science programs (who typically rank the highest in "credential fit" and "job related to field of study" analyses) are below average with respect to skill value-added for critical thinking and writing skills.

Differences by education level and by field of study for skill value-added for social skills (teamwork and leadership) were of little consequence. What is more interesting is the large minority of 1995 graduates (both university and non-university) in the "low" skill value-added category – about 30% for teamwork skills and about 40% for leadership skills. Based on this measurement approach, it would appear that post-secondary institutions are much less likely to be developing strong "social" employment-related skills as compared to cognitive, communication, and use of new technology skills.

With the exception of teamwork and use of new technology skills where differences by level of education were negligible, university (under)graduates were more likely than graduates of trade/vocational and career/technical programs to report using their employment-related skills on the job. Comparing across the six skill sets (and ignoring level of education differences), about 70% of all post-secondary graduates reported extensive use of teamwork skills in their current job. Less than 40% indicated that they made use of their leadership skills that frequently. Close to 60% of all graduates indicated that they used their critical thinking and problem solving skills frequently in their work, while somewhat less than half reported extensive use of writing and new technology skills. Thus, there does appear to be some under-utilization of employment skills among recent post-secondary graduates.

By combining information on "skill value-added" (from post-secondary education programs) with "skill use on the job" data, we can begin to assess the workplace contribution made by Canadian post-secondary education institutions. We find that about one-quarter of all graduates are in the "very high" skill value-added used on the job category for critical thinking skills, compared to about 20% for problem solving, writing, teamwork, and use of new technology skills. But only 10% of all post-secondary graduates are in the "very high" category for leadership skills.

For cognitive (critical thinking and problem solving), university (under)graduates are more likely to be in the "very high" skill value-added used on the job category, compared to non-university graduates. Field of study differences are fairly predictable, with health science and other professional programs standing out, along with "hard science" and engineering programs. For writing skills, university (under)graduate programs also make a larger workplace contribution, with arts, law, and education graduates being over-represented in the "very high" category. For use of new technology skills, graduates of trade/vocational and career/technical programs are somewhat more likely than university (under)graduates to be in the "very high" skill value-added used on the job category. However, there are no differences by education level for social skills .

Multi-variate analyses comparing the relative impact of respondent characteristics, labour market characteristics, and field of study on "skill value-added used on the job" suggest that some of the impact of "field of study" is a function of labour market factors. Thus, graduates in professional/managerial occupations are typically more likely to be in the "very high" skill value-added used on the job category. Frequently, the same pattern is observed for those in full-time (compared to part-time) positions. Since graduates of professional programs (particularly at the university level) are more likely to be hired into managerial/professional and full time positions (in part, because they bring with them more recognizable credentials), some of the "skill value-added" developed by non-professional programs (e.g., critical thinking and problem solving skills enhanced via traditional arts and science programs) may not be transferred to the workplace because of employers' hiring decisions. Even so, it is apparent that the writing skills developed in university liberal arts, law, and education programs do appear to be used on the job by graduates to a considerable extent.

6.2 Conclusions

Our comparison of the *program-job match* approach (using 1990 NGS data) and the *generic skills* approach (using 1995 NGS data) to measuring education-job skills fit assumes that we can directly compare responses from the "class of 1990" and the "class of 1995." We recognize that the 1995 cohort entered a somewhat more difficult labour market. Specifically, the percentage employed was a bit lower, as was the proportion employed in professional/managerial positions. In addition, non-standard work (part-time and temporary employment, and multiple job-holding) had become more common.

Despite these cohort differences, we proceeded on the assumption that *if* the "class of 1995" had been asked the program-job match questions asked of the 1990 graduates, the patterns of variation across type/level of education and across fields of study would have been similar (although the overall level of education-job match might have changed). That said, our comparison of the two measurement approaches leads us to the following eight general conclusions:

- Comparisons of education-job fit between university (under)graduates and trade/vocational and career/technical graduates do not reveal a consistent pattern whereby one group typically enjoys a closer fit. Depending on the measurement approach (and the type of skill examined, if the approach differentiates between skill types), either type of post-secondary program may appear to be functioning more effectively (with respect to education-job skills match). However, education-job fit is almost always tighter for masters and Ph.D. level university graduates, no matter how it is measured.

- Whatever our approach to measuring education-job skills match (and regardless of the level/type of post-secondary education), we tend to find a better match for graduates from professional programs, particularly graduates in the health science field. Such post-secondary programs are designed to train graduates for specific occupational locations, and they are generally successful in doing so.

- If we use a "credential fit" measurement approach (1990 NGS data), we observe a higher level of education-job fit than when we examine the proportion of graduates in jobs "closely

related" to their field of study (1990 NGS data). To a considerable extent, this finding simply reflects the fact that it is impossible to enter some professional occupations without the requisite post-secondary credential. The generic skills approach (using 1995 NGS data), as we have constructed it (i.e., the proportion of graduates in a "very high" skill value-added used on the job category), reveals the lowest level of education-job fit.

- The generic skills approach is a more useful approach for assessing the effectiveness of Canadian post-secondary institutions in developing desirable employment-related skills. The "credential fit" approach simply tells us how often employers set out to obtain graduates with a presumed set of skills, without determining whether these skills actually exist. The "job related to field of study" approach moves us in the right direction, but does not focus on specific skills. In contrast, the generic skills approach allows us to examine a range of different skills across three key dimensions: skill level; skill acquisition within post-secondary institutions; and skill use on the job.

- When using the "credential fit" approach, field of study differences are very large. Compared to occupationally-specific health science programs, for example, humanities and social science university undergraduate programs appear to be making a minimal labour market contribution. As we move to the "job related to field of study" approach, the difference between occupationally-specific programs and general arts programs declines somewhat. When we use the "generic skills" measurement approach, field of study differences are frequently much smaller. In fact, depending on the skill in question, some post-secondary programs that fare poorly in a "credential fit" analysis appear to be much more effective in assessments of "skill value-added from higher education." University undergraduate programs in the humanities, for example, are much more likely to enhance the writing and critical thinking skills of their graduates, compared to occupationally-specific programs.

- Excluding university graduate programs from the comparison, some skills are clearly more likely to be enhanced in university-based programs (e.g., critical thinking and writing skills), while others (e.g., use of new technology skills) are somewhat more likely to be enhanced in trade/vocational and career/technical programs.

- Compared to cognitive, communication, and use of new technology skills, leadership and teamwork skills are least likely to be developed within post-secondary programs of study, both inside and outside the university system.

- Education-job fit is not simply a function of the training provided within different types of post-secondary educational programs. Labour market opportunities for graduates also play a significant part. For example, traditional arts and science programs appear to do a good job in developing critical thinking skills. However, graduates of these programs are less likely to find jobs that take advantage of these skills. Thus the problem may not lie so much in the post-secondary system as in the labour market. Nevertheless, there is evidence that the writing skills developed in liberal arts programs are used to a considerable extent on the job.

These analysis results are provocative, but not definitive. More research is needed. Within post-secondary institutions, it would be useful to study exactly how employment-related skills are developed. Within employment settings, it would be equally valuable to determine how different types of skills are used. The range of skills to be studied could be broadened beyond the six skill sets examined in the 1995 NGS. For example, inclusion of oral communication skills in the survey would clearly enhance the value of the database. It might also be useful to disaggregate the "trade/vocational and career/technical" category to determine whether there are important differences in skill acquisition between these two components of the non-university post-secondary sector. And, recognizing the difficulty in doing so, it would also be very useful to try to develop objective tests of some of these employment-related skills and, subsequently, to use such tests to validate self-report measures of the type used in this study.

These research findings also have important implications for policy makers, educators, and employers. Although this report was not intended to be a policy document, it is fitting that it should conclude with a few comments about such implications.

- At a time when the many different types of institutions in the post-secondary sector are competing for scarce public resources, it is important to recognize that some programs seen as less "useful" when assessed with a "credential fit" approach may, in fact, be making a highly significant contribution. For example, shifting resources away from university to non-university programs, and from traditional arts and science programs towards more

occupationally-specific programs, may be counter-productive, if the intent is to develop a broader base of employment-related skills within the Canadian workforce.

- The analyses in this report demonstrate that leadership and teamwork skills are less likely to be developed within the post-secondary system, compared to cognitive, communication, and new technology skills. Whether or not educators conclude that the post-secondary system should be charged with developing such "social" employment-related skills, it would still be useful to ask whether they could be enhanced while pursuing other more primary educational and training goals. Similarly, while recognizing that different post-secondary programs have very different educational mandates, it would be useful for providers of all programs to ask whether a broader range of employment-related skills, including communication, cognitive, and technology skills, could be developed without sacrificing an emphasis on the core curriculum in their programs.

- Like a number of other recent studies of skill use in the Canadian labour market, this report demonstrates that a significant minority of post-secondary graduates do not have the opportunity to use all of their employment-related skills in their jobs. In order to take full advantage of the human capital being created in Canada's post-secondary system, employers should be encouraged to seek ways to enhance the skill requirements of jobs in their workplaces. They should also be invited to look outside the traditional programs that have provided their new employees. This report clearly demonstrates that some generic employment-related skills seen as essential in today's knowledge economy (e.g., communication and cognitive skills) are being developed in programs with less occupationally-specific training mandates.

Appendix

Appendix Table A1 **Percentage of Graduates Still Enrolled Two Years after Gradation by Type/Level of Education and Field of Study (of original degree); 1990 & 1995 NGS**

Education Level/Field of Study	1990 NGS *			1995 NGS **		
	Total	*Non-students*	*Percent enrolled*	*Total*	*Non-students*	*Percent enrolled*
Trade/Vocational and Career/Technical Programs						
Business and commerce	3440	3176	7.7	5568	5084	8.7
Arts and humanities	1075	980	8.8	1426	1294	9.3
Social science and services	1662	1527	8.1	2115	1850	12.5
Natural science and applied sciences	1209	1116	7.7	1824	1668	8.6
Engineering and applied sciences	5922	5465	7.7	7529	6868	8.6
Health sciences and related	2221	2120	4.5	2048	1831	10.6
Total	**15529**	**14384**	**7.4**	**20600**	**18595**	**9.8**
University Undergraduate Programs						
Commerce, management and administration	1134	1032	9.0	1596	1251	21.6
Fine and applied arts	295	225	23.7	356	291	18.3
Humanities	1090	819	24.9	1561	1182	24.3
Social sciences	1993	1530	23.2	2465	1872	24.1
Law	273	240	12.1	297	263	11.4
Agricultural and biological sciences	1005	687	31.6	1240	789	36.4
Mathematics and physical sciences	897	723	19.4	1123	825	26.5
Engineering and applied sciences	969	817	15.7	1252	1024	18.2
Medicine and dentistry	311	276	11.3	246	163	33.7
Other health professions	707	664	6.1	890	706	20.7
Education	1832	1722	6.0	1451	1256	13.4
Total	**10506**	**8735**	**16.9**	**12477**	**9622**	**22.9**

(continued)

Appendix Table A1 (continued)

Education Level/Field of Study	1990 NGS *			1995 NGS **		
	Total	*Non-students*	*Percent enrolled*	*Total*	*Non-students*	*Percent enrolled*
University Masters-level Programs						
Commerce/management/administration	913	885	3.1	895	801	10.5
Fine arts/humanities/social sciences	1893	1559	17.6	2212	1705	22.9
Biological and physical sciences/engineering	1671	1265	24.3	1689	1283	24.0
Health professions	558	454	1836	632	513	19.0
Education	1326	1269	4.3	1122	1001	10.8
Total	**6361**	**5432**	**14.6**	**6550**	**5303**	**19.0**
University Doctoral-level Programs						
Commerce/arts	559	551	1.4	701	675	3.7
Science/health	887	850	4.2	1024	949	7.3
Education	178	176	1.1	205	202	1.5
Total	**1624**	**1577**	**2.9**	**1930**	**1826**	**5.4**
Total	**34020**	**30128**	**11.4**	**41557**	**35346**	**14.9**

Note: Unweighted data; NWT respondents excluded, as well as those with "general arts and science" degrees and unknown fields of study.

* Students (in 1992) were identified by responses to Q. D1a ("*During (the last week of October 1991) were you enrolled in any credit courses at an educational or training institution?*"). In addition, respondents who were currently working part-time (in June 1992) because they were "going to school" (Q. C33) were added to the "student" category.

** Students (in 1997) were identified by responses to Q. C68 ("*Last week, were you enrolled in any credit courses at an educational or training institution?*").

Appendix Table A2 **Field of Study by Type/Level of Education, Non-Students Only; 1990 NGS and 1995 NGS**

Education Level/Field of Study	1990 NGS (%)	1995 NGS (%)
Trade/Vocational and Career/Technical Programs	*46*	*51*
Business and commerce	24	29
Arts and humanities	8	9
Social science and services	14	15
Natural science primary industry	5	5
Engineering and applied science	31	29
Health sciences and related	*18*	*13*
Total (weighted N)	**100 (85,915)**	**100 (122,272)**
University Undergraduate Programs	*46*	*41*
Commerce, management and administration	14	14
Fine and applied arts	3	3
Humanities	11	12
Social Sciences	22	22
Law	4	4
Agricultural and biological sciences	6	5
Mathematics and physical sciences	6	5
Engineering and applied sciences	7	7
Medicine and dentistry	2	1
Other health professions	6	6
Education	*19*	*21*
Total (weighted N)	**100 (86,220)**	**100 (99,134)**
University Masters-level Programs	7	7
Commerce/management/administration	22	20
Fine arts/humanities/social sciences	33	33
Biological and physical sciences/engineering	17	18
Health professions	6	9
Education	*22*	*20*
Total (weighted N)	**100 (13,730)**	**100 (16,026)**
University Doctoral-level Programs	1	1
Commerce/arts	36	36
Science/health	53	54
Education	*11*	*10*
Total (weighted N)	**100 (1,972)**	**100 (2,387)**
Total (weighted N)	***(187,837)***	***(237,818)***

Note: Weighted data; current students excluded (see Appendix Table A1), along with NWT respondents, as well as those with "general arts and science" degrees and unknown fields of study.

Appendix Table A3 **Post-Graduation Occupational Outcomes (SOC) by Education Level/Field of Study, 1990 & 1995 NGS**

Education Level/Field of Study	Occupation (%) *					
	Professional/Managerial		*Clerical/Sales/Service*		*Blue Collar/Other*	
	1990	*1995*	*1990*	*1995*	*1990*	*1995*
Trade/Vocational and Career/Technical	***48***	***39***	***30***	***35***	***22***	***27***
Business and commerce	32	28	63	62	5	10
Arts and humanities	47	40	37	45	15	14
Social science and services	56	47	38	45	5	8
Natural science and primary industries	35	28	17	16	49	56
Engineering and applied science	30	27	16	15	54	58
Health sciences and related	92	79	6	16	2	5
University Undergraduate	***78***	***74***	***18***	***21***	***4***	***5***
Commerce, management and administration	71	71	27	24	2	4
Fine and applied arts	70	73	25	23	5	4
Humanities	70	64	23	30	7	6
Social sciences	64	59	32	35	4	6
Law	91	78	8	22	0	1
Agriculture and biological sciences	67	56	23	31	11	13
Mathematics and physical sciences	82	84	14	10	5	6
Engineering and applied sciences	86	81	4	8	10	10
Medicine and dentistry	99	97	1	3	0	0
Other health professions	97	97	3	3	0	1
Education	92	85	6	11	1	4
University Masters-level	***93***	***91***	***5***	***7***	***1***	***2***
Commerce/management/administration	90	87	9	11	1	1
Fine arts/humanities/social sciences	92	88	7	10	1	2
Biological and physical sciences/engineering	94	94	3	3	3	3
Health professions	96	96	3	4	1	0
Education	99	97	2	2	0	1
University Doctoral-level	***98***	***98***	***1***	***1***	***1***	***1***
Commerce/arts	98	97	1	3	0	0
Science/health	98	99	1	1	1	1
Education	99	99	1	1	0	0

* Source: *Standard Occupational Classification*, Statistics Canada, Minister of Supply and Services, Ottawa, 1981.

Appendix Table A4 **Non-Standard Employment by Education Level/Field of Study, 1990 & 1995 NGS**

Education Level/Field of Study	% Part-time		% Self-employed		% Multiple Jobs		% Temporary	
	1990	*1995*	*1990*	*1995*	*1990*	*1995*	*1990*	*1995*
Trade/Vocational and Career/Technical	***12***	***15***	***4***	***7***	***11***	***15***	***21***	***22***
Business and commerce	10	15	3	6	9	13	18	21
Arts and humanities	17	19	12	18	14	18	30	35
Social science and services	15	20	2	5	13	18	21	24
Natural science and primary industries	8	6	9	12	9	12	36	35
Engineering and applied science	5	4	5	6	8	10	22	19
Health sciences and related	23	31	1	4	15	25	16	18
University Undergraduate	***9***	***16***	***6***	***6***	***10***	***15***	***27***	***31***
Commerce, management and administration	4	5	5	7	7	9	15	18
Fine and applied arts	27	35	13	21	19	28	43	44
Humanities	13	23	6	6	12	14	34	39
Social sciences	11	16	5	6	12	18	28	28
Law	3	7	17	18	7	10	34	46
Agriculture and biological sciences	7	12	7	8	13	15	38	40
Mathematics and physical sciences	4	7	4	5	6	9	22	23
Engineering and applied sciences	1	2	4	5	6	6	15	16
Medicine and dentistry	4	5	30	17	10	4	75	63
Other health professions	9	17	3	6	11	22	17	19
Education	14	25	1	2	10	20	27	42
University Masters-level	***8***	***10***	***7***	***11***	***8***	***13***	***22***	***26***
Commerce/management/administration	2	3	8	12	6	8	13	16
Fine arts/humanities/social sciences	15	18	8	15	12	17	31	37
Biological and physical sciences/engineering	5	5	5	8	6	10	24	25
Health professions	10	10	13	18	10	14	31	35
Education	7	10	3	5	6	12	14	17
University Doctoral-level	***5***	***7***	***9***	***8***	***11***	***16***	***39***	***41***
Commerce/arts	8	13	7	11	13	22	34	40
Science/health	2	3	10	6	9	12	44	43
Education	7	8	11	10	13	21	25	34

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